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THE

# MISCELLANEOUS DOCUMENTS

PRINTED BY ORDER OF

# THE HOUSE OF REPRESENTATIVES

DURING THE

FIRST SESSION OF THE THIRTY-FIFTH CONGRESS.

1857-'58.

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IN THREE VOLUMES.

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WASHINGTON:
JAMES B. STEEDMAN, PRINTER.
1858.

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TO THE

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35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 69.

# GEORGIA MOUNTED VOLUNTEERS.

## RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF GEORGIA,

ASKING

*That bounty land may be granted the officers and soldiers of the several companies of mounted volunteers called into the service of the State of Georgia under the provisions of an act assented to December* 26, 1837.

FEBRUARY 25, 1858.—Referred to the Committee on Public Lands, and ordered to be printed.

RESOLUTION.

Whereas several companies of mounted volunteers were called into the service of the State of Georgia under the provisions of an act assented to on the 26th of December, 1837; and whereas said companies have been paid for said service by the State of Georgia; and whereas it is doubtful whether said soldiers are entitled to bounty land under the provisions of the act of Congress of 1855 and 1856: Therefore—

*Be it resolved by the senate and house of representatives of the State of Georgia in general assembly met,* That our senators in Congress be instructed, and our representatives requested, to use their best exertions to have an act passed allowing each of said soldiers one hundred and sixty acres of bounty land who have not heretofore had bounty land.

*And be it further resolved,* That his excellency be, and he is hereby, required to transmit a copy of these resolutions to our senators and representatives in Congress.

JOHN W. H. UNDERWOOD,
*Speaker of the House of Representatives.*
JOHN E. WARD,
*President of the Senate.*

Attest: ALEX. M. SPEER,
*Clerk of the House.*

Assented to December 22, 1857.

JOSEPH E. BROWN,
*Governor.*

SECRETARY OF STATE'S OFFICE,
*Milledgeville, Georgia, January* 27, 1858.

I hereby certify that the foregoing is a true copy of the enrolled resolution on file in this office.

Given under my hand and seal of office.

[SEAL.] E. P. WATKINS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 70.

# RULES OF EVIDENCE—BOUNTY LAND.

## RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF GEORGIA,

ASKING

*For the passage of a law fixing the rules of evidence regulating the granting of bounty land to certain officers and soldiers therein mentioned.*

FEBRUARY 25, 1858.—Referred to the Committee on Public Lands and ordered to be printed.

### RESOLUTION.

Whereas, There are a number of persons now citizens of Georgia, and in some instances removed to other States, who rendered important services to the United States in 1836, 1837 and 1838, in the removal of the Cherokee, Creek and Seminole Indians; and whereas, there are many others who rendered like services in the war against Great Britain and the Seminole and Creek Indians, usually known as "the late war," and also in the campaign against the Seminoles in 1817 and 1818; and whereas, said persons were called into service in emergency, so that no full and regular record of their services was made by the several officers commanding, and sent up to the proper department at Washington, therefore,

*Resolved*, That the senators and representatives of Georgia in the United States Congress be, and they are hereby, requested to use every honorable effort to have an act passed, so fixing the rules of evidence in relation to such cases as will be mutually safe to the country and equitable to said applicants, to the end that all just and meritorious applications of services above indicated may be placed upon such basis, as regards testimony, as they will result successfully to the applicants; and that his excellency the governor be, and he is hereby,

requested to communicate a copy of this preamble and resolution to the said senators and representatives of Georgia.

JOHN W. H. UNDERWOOD,
*Speaker of the House of Representatives.*
JOHN E. WARD,
*President of the Senate.*
Attest: ALEX. M. SPEER,
*Clerk of the House.*

Assented to December 22, 1857.
JOSEPH E. BROWN, *Governor.*

---

SECRETARY OF STATE'S OFFICE,
*Milledgeville, Georgia, January* 26, 1858.

I hereby certify that the following is a true copy of the enrolled resolution of file in this office.

[L. S.] Given under my hand and seal of office.

E. P. WATKINS,
*Secretary of State.*

# MARTIAL LAW IN THE TERRITORY OF WASHINGTON.

## RESOLUTIONS

OF

## THE TERRITORY OF WASHINGTON,

RELATIVE TO

*The proclamation of martial law by Governor Stevens.*

MARCH 1, 1858.—Ordered to be printed.

RESOLUTION relative to the proclamation of martial law over the counties of Pierce and Thurston, by Isaac I. Stevens, late governor of Washington Territory.

Whereas, in the prosecution of the late Indian war, Isaac I. Stevens, late governor of the Territory of Washington, proclaimed and enforced martial law in the counties of Pierce and Thurston, and for which he received unmerited condemnation by a certain resolution of the legislative assembly passed January 16, 1857: Therefore—

*Be it resolved by the legislative assembly of the Territory of Washington*, That, in thus proclaiming and enforcing martial law, we believe Governor Isaac I. Stevens to have been actuated by motives of the purest patriotism, and with a desire only for the safety, welfare, and prosperity of the Territory.

*Resolved*, That, in our opinion, the state of the country demanded that stringent measures should be adopted, and such as could be effected by martial law only; and that there was absolute necessity for the same, sufficiently evidenced by the fact that the enemy, who, prior to its existence, were constantly on the alert, and supplied with information of all operations, after its enforcement were continually struck by our gallant troops, and soon reduced to submission.

*Resolved*, That the resolution passed January 16, 1857, does not now, and did not at that time, express the opinion of a majority of the citizens of Washington Territory; but was in direct contravention of the same—a fact manifested by the triumphant election of Governor Stevens as our delegate in Congress, receiving in such election over two-thirds of the votes cast.

*Resolved*, That the secretary of the Territory be requested to transmit copies of these resolutions to the President of the United States,

the President of the Senate, the Speaker of the House of Representatives, and the Hon. Isaac I. Stevens.

Passed house of representatives January 9, 1858.

J. S. M. VANCLEVE,
*Speaker of the House of Representatives.*

Passed council January 19, 1858.

C. C. PAGETT,
*President of the Council.*

SECRETARY'S OFFICE,
*Olympia, January* 25, 1858.

A true copy. Attest:
[L. S.]

C. H. MASON.
*Secretary of Territory.*

---

TERRITORY OF WASHINGTON, SECRETARY'S OFFICE,
*Olympia, January* 25, 1858.

SIR: In compliance with the request of the legislative assembly, herewith, I have the honor to transmit to you a copy of the resolution relative to the proclamation of martial law over the counties of Pierce and Thurston, by Isaac I. Stevens, late governor of Washington Territory.

I am, sir, very respectfully, your obedient servant.

C. H. MASON,
*Secretary of Territory.*

The SPEAKER OF THE HOUSE OF REPRESENTATIVES,
*Washington City.*

BALANCES, &c.

# LETTER

FROM THE

# SECRETARY OF THE TREASURY,

COMMUNICATING

*Statements of balances of appropriations, &c., &c.*

MARCH 3, 1858.—Referred to the Committee of Ways and Means.

TREASURY DEPARTMENT, *February* 26, 1858.

SIR: In compliance with the request of the Committee of Ways and Means, I have the honor to enclose herewith the letter of the Register of the Treasury, of this date, accompanied by the following statements, prepared in his office, viz:

1st. The balances of all appropriations standing upon the books of the treasury for all purposes, on 22d January, 1858.

2d. The amount (estimated) that may be required for the service of the government, under each head of appropriation, to 30th June, 1858.

3d. The amount (estimated) of each appropriation applicable to the service of the fiscal year ending 30th June, 1859.

I am, very respectfully,

HOWELL COBB,
*Secretary of the Treasury.*

Hon. J. GLANCY JONES,
*Chairman Com. Ways and Means, Ho. of Reps.*

TREASURY DEPARTMENT,
*Register's Office, February* 26, 1858.

SIR: I have the honor to transmit herewith sundry statements of appropriations, prepared in compliance with the request of the Committee of Ways and Means of the 22d ultimo, referred to this office.

These statements show:

1st. The balances of all appropriations standing upon the books of the treasury for all purposes, on 22d January, 1858.

2d. The amount (estimated) that may be required for the service of the government, under each head of appropriation, to 30th June, 1858.

3d. The amount (estimated) of each appropriation applicable to the service of the fiscal year ending 30th June, 1859.

The completion of these statements has been delayed in consequence of not obtaining sooner from some of the offices the necessary information required to divide the expenditure of the appropriations into the two periods.

I am, very respectfully, your obedient servant,

C. T. JONES,
*Acting Register.*

Hon. HOWELL COBB,
*Secretary of the Treasury.*

## No. 1.

### APPROPRIATIONS UNDER THE CONTROL OF THE DEPARTMENT OF STATE.

*Statement of balances of appropriations on 22d January, 1858, the amounts (estimated) that may be required for the service of the government to the 30th June, 1858, and the amounts (estimated) applicable to the service of the fiscal year ending June 30, 1859.*

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation of the Secretary of State | $4,000 00 | $4,000 00 | ---------- |
| Compensation of Assistant Secretary of State | 1,500 00 | 1,500 00 | ---------- |
| Compensation of clerks, &c., in office of Secretary of State | 22,000 00 | 22,000 00 | ---------- |
| Copperplate printing, books, maps, &c., in office of Secretary of State | 2,500 02 | 500 02 | $2,000 00 |
| To purchase 50 copies, each, of volumes 20 and 21 of Howard's Reports | 500 00 | 500 00 | ---------- |
| Newspapers for Department of State | 600 00 | 400 00 | 200 00 |
| To defray expenses incurred, and to be incurred, in complying with resolution of the House of Representatives, December 26, 1854 | 2,000 00 | 1,000 00 | 1,000 00 |
| Publishing the laws in pamphlet form, and in the newspapers of the States, &c., for office of Secretary of State | 54,958 50 | 24,958 50 | 30,000 00 |
| Proof-reading, packing and distributing laws and documents, including cases, labor, &c., in office of Secretary of State | 39,363 17 | 7,000 00 | 32,363 17 |
| Extra clerk hire and copying in the Department of State | 2,300 00 | 1,300 00 | 1,000 00 |
| Stationery, blank books, &c., in the Department of State | ---------- | ---------- | ---------- |
| Miscellaneous items in the Department of State | 1,000 00 | 1,000 00 | ---------- |
| Compensation of watchmen and laborers of northeast executive building | 1,800 00 | 1,800 00 | ---------- |
| Salaries of ministers of United States to Great Britain, &c | 226,537 29 | 125,000 00 | 101,537 29 |
| Contingent expenses of all the ministers abroad | 116,871 55 | 40,000 00 | 76,871 55 |

## STATEMENT—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Relief and protection of American seamen | $46,153 95 | $46,153 95 | |
| Salaries of consuls of the United States and commercial agents, &c | 299,758 78 | 159,758 78 | $140,000 00 |
| Office rent for those consuls general, consuls, and commercial agents, &c., who are not allowed to trade | 12,317 51 | 12,317 51 | |
| For the purchase of blank books, stationery, arms of the United States, presses, flags, &c., for the consuls of the United States | 3,382 94 | 3,382 94 | |
| For per diem of commissioner and compensation to surveyor, provided in the 1st article of treaty with Great Britain &c | 4,184 00 | | 4,184 00 |
| For compensation o the commissioner, secretary, chief astronomer, and surveyor, &c., employed in running the boundary between British possessions and United States, &c | 71,000 00 | 71,000 00 | |
| For estimated loss by exchange on drafts of consuls and commercial agents, for salaries, &c | 79,585 42 | 9,585 42 | 70,000 00 |
| For the payment of expenses attending the employment of sailing vessels, &c., for surveys and umpirage, &c | 11,750 00 | | 11,750 00 |
| For travelling expenses, transportation, &c., for surveys and umpirage, &c | 700 00 | | 700 00 |
| For salary of the dragoman to the legation to Turkey | | | |
| For compensation for clerical services performed in the office of the United States legation at London | 1,000 00 | 1,000 00 | |
| For salary of the interpreter and secretary to mission to China | 4,750 00 | 4,750 00 | |
| For salaries of secretaries of legation of the United States to Great Britain, &c | 54,216 60 | 14,000 00 | 40,216 60 |
| For salary to commissioner to the Sandwich Islands | 2,468 50 | | 2,468 50 |
| For intercourse with the Barbary powers | 1,567 67 | | 1,567 67 |
| For contingent expenses of foreign intercourse | 49,997 79 | 29,997 79 | 20,000 00 |
| For compensation to the consul general to reside at Simoda, in Japan | 5,000 00 | | 5,000 00 |
| For interpreters, guards, and other expenses of the consulate at Beyrout | 1,000 00 | | 1,000 00 |
| For salary of consul general to reside in the British North American Provinces | 5,459 78 | | 5,459 78 |
| For interpreters, guards, and other expenses of the consulates at Constantinople | 5,041 74 | 5,041 74 | |
| For salaries of consuls at Kwang, Choo, Amoy, &c | 5,296 76 | | 5,296 76 |

## STATEMENT—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Relief and protection of American seamen | $46,153 95 | $46,153 95 | ---------- |
| Salaries of consuls of the United States and commercial agents, &c | 299,758 78 | 159,758 78 | $140,000 00 |
| Office rent for those consuls general, consuls, and commercial agents, &c., who are not allowed to trade | 12,317 51 | 12,317 51 | ---------- |
| For the purchase of blank books, stationery, arms of the United States, presses, flags, &c., for the consuls of the United States | 3,382 94 | 3,382 94 | ---------- |
| For per diem of commissioner and compensation to surveyor, provided in the 1st article of treaty with Great Britain, &c | 4,184 00 | ---------- | 4,184 00 |
| For compensation of the commissioner, secretary, chief astronomer, and surveyor, &c., employed in running the boundary between British possessions and United States, &c | 71,000 00 | 71,000 00 | ---------- |
| For estimated loss by exchange on drafts of consuls and commercial agents, for salaries, &c | 79,585 42 | 9,585 42 | 70,000 00 |
| For the payment of expenses attending the employment of sailing vessels, &c., for surveys and umpirage, &c | 11,750 00 | ---------- | 11,750 00 |
| For travelling expenses, transportation, &c., for surveys and umpirage, &c | 700 00 | ---------- | 700 00 |
| For salary of the dragoman to the legation to Turkey | ---------- | ---------- | ---------- |
| For compensation for clerical services performed in the office of the United States legation at London | 1,000 00 | 1,000 00 | ---------- |
| For salary of the interpreter and secretary to mission to China | 4,750 00 | 4,750 00 | ---------- |
| For salaries of secretaries of legation of the United States to Great Britain, &c | 54,216 60 | 14,000 00 | 40,216 60 |
| For salary to commissioner to the Sandwich Islands | 2,468 50 | ---------- | 2,468 50 |
| For intercourse with the Barbary powers | 1,567 67 | ---------- | 1,567 67 |
| For contingent expenses of foreign intercourse | 49,997 79 | 29,997 79 | 20,000 00 |
| For compensation to the consul general to reside at Simoda, in Japan | 5,000 00 | ---------- | 5,000 00 |
| For interpreters, guards, and other expenses of the consulate at Beyrout | 1,000 00 | ---------- | 1,000 00 |
| For salary of consul general to reside in the British North American Provinces | 5,459 78 | ---------- | 5,459 78 |
| For interpreters, guards, and other expenses of the consulates at Constantinople | 5,041 74 | 5,041 74 | ---------- |
| For salaries of consuls at Kwang, Choo, Amoy, &c | 5,296 76 | ---------- | 5,296 76 |

| | | | |
|---|---|---|---|
| To reimburse the consular agent of the United States at the island of St. Thomas in relation to his expenses on the cargo of the barque Amelia | 46 15 | | 46 15 |
| Expenses of releasing from captivity among the Indians of Queen Charlotte's Island the crew, &c., of sloop Georgiana | 5,807 58 | 2,000 00 | 3,807 58 |
| Expenses attending the execution of the neutrality act of 12th April, 1818, in reference to compensation of ministers, &c., residing on the coast of Barbary | 9,500 00 | 1,500 00 | 8,000 00 |
| Awards under the 15th article between the United States and Mexico | 82,271 49 | 3,957 66 | 78,313 83 |
| For the prosecution of the work, including pay of commissioner, &c., provided in the 1st article of the reciprocity treaty with Great Britain | 7,135 00 | | 7,135 00 |
| Boats and other incidental expenses connected with the duty of commissioner in the 1st article of the reciprocity treaty with Great Britain | 5,222 86 | | 5,222 86 |
| Compensation to commissioner, provided in the 1st article of the reciprocity treaty with Great Britain | 2,000 00 | | 2,000 00 |
| Expenses incurred by the provisional government of Oregon in defending the people of the Territory from the Cayuse Indians, &c. | 13,993 93 | 6,993 93 | 7,000 00 |
| Awards under the convention between the United States and Peru, concluded at Lima | 2,270 53 | 1,770 53 | 500 00 |
| Awards under the convention between the United States and the Emperor of Brazil | 15,672 95 | 1,000 00 | 14,672 95 |
| Awards under the convention between the United States and the Mexican Republic | 2,250 47 | | 2,250 47 |
| To conclude a treaty of peace with Mexico | 384 50 | | 384 50 |
| Awards under the 1st article of the treaty of Ghent | 4,112 89 | | 4,112 89 |
| Awards under the convention with Denmark | 2,453 53 | | 2,453 53 |
| Awards under the convention with the Two Sicilies | 166 67 | | 166 67 |
| Awards under the convention with the King of the French | 4,945 94 | | 4,945 94 |
| Payment of certain certificates, as authorized per act March 3, 1847 | 138 64 | | 138 64 |
| Claims on Spain | 2,427 31 | | 2,427 31 |
| Claims on France | 11,731 02 | | 11,731 02 |
| Total | 1,313,093 43 | 605,168 77 | 707,924 66 |

## No. 2.

*Balances of appropriations on January* 22, 1858, *in relation to the civil, miscellaneous, and public debt, the amount (estimated) that may be required for the service of the government to the* 30*th June*, 1858, *and the amounts (estimated) applicable to the service of the fiscal year ending June* 30, 1859.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation and mileage of Senators of the United States | $124,121 56 | $89,402 94 | $34,718 62 |
| Compensation and mileage of members of the House of Representatives | 600,484 50 | 264,734 50 | 355,750 00 |
| Books for the Senate of the United States | 1,000 00 | 1,000 00 | ---------- |
| Miscellaneous items for the Senate of the United States | 2,000 00 | 2,000 00 | ---------- |
| Clerks to committees and President *pro tempore*, draughtsmen, &c., for the Senate | 22,955 20 | 22,955 20 | ---------- |
| Congressional Globe and binding for the same, for the Senate | 44.008 42 | 44,008 42 | ---------- |
| Reporting proceedings for the Senate | 15,000 00 | 15,000 00 | ---------- |
| Compensation of the officers, clerks, &c., receiving an annual salary in the Senate | 41,914 63 | 41,914 63 | ---------- |
| Fuel, oil, and candles, for the House of Representatives | 654 19 | 654 19 | ---------- |
| Horses and carri ges and saddle horses, for the House of Representatives | 1,645 86 | 1,645 86 | ---------- |
| Newspapers for the House of Representatives | 10,634 77 | 10,634 77 | ---------- |
| Pages and employés of the House of Representatives | 500 00 | 500 00 | ---------- |
| For laborers of the House of Representatives | 1,323 38 | 1,323 38 | ---------- |
| Salaries of Capitol police, House of Representatives | 3,158 13 | 3,158 13 | ---------- |
| Draughtsmen and clerks on the maps of the public lands, House of Representatives | 265 30 | 265 30 | ---------- |
| Binding the Congressional Globe and Appendix, for the 1st session 33d Congress | 40 | ---------- | 40 |
| Printing and publishing 1,000 copies of the papers of James Madison, &c. | 6,000 00 | ---------- | 6,000 00 |
| Expenses of procuring apparatus for warming the Library of Congress, and fuel, &c. | 3,000 00 | 3,000 00 | ---------- |
| Publication of the works of Thomas Jefferson, &c. | 54 99 | ---------- | 54 99 |
| Support of the public green houses, including pay of the horticulturist, &c. | 2,121 50 | 2,121 50 | ---------- |

| | | | |
|---|---|---|---|
| Procuring tools, manure, &c., for the Botanic Gardens, &c. | 1,700 00 | 1,700 00 | |
| Engraving maps, charts, and other plates accompanying documents ordered to be printed for the 1st session 34th Congress | 19,000 00 | 19,000 00 | |
| For the Statutes at Large, for the use of the members of the House of Representatives, &c. | 45 50 | 45 50 | |
| To pay for 100 copies of the continuation of the Annals of Congress, for the Library of the House of Representatives | 500 00 | | 500 00 |
| To pay for the continuation of the Annals of Congress for the members of the 32d Congress | 2,000 00 | | 2,000 00 |
| Compensation of officers, clerks, &c., receiving an annual salary in the House of Representatives | 41,090 06 | 41,090 06 | |
| Furniture, repairs, and boxes for books, House of Representatives | 5,428 49 | 5,428 49 | |
| Furniture for the committee rooms in the south wing of the extension of the Capitol | 136 14 | 136 14 | |
| Engraving, electrotyping, and lithographing, for the House of Representatives | 18,341 49 | 18,341 40 | |
| Pages and mail boys for the House of Representatives | 6,551 64 | 6,551 64 | |
| Folding documents, &c., for the House of Representatives | 7,282 88 | 7,282 88 | |
| Binding documents, &c., for the House of Representatives | 89,696 48 | 89,696 48 | |
| Reporting and publishing the proceedings of the House of Representatives | 1,713 13 | | 1,713 13 |
| Clerks on land maps, clerks to committees, a temporary clerk in the office of the Clerk of the House of Representatives | 22,648 42 | 22,648 42 | |
| Stationery for the House of Representatives | 2,000 00 | 2,000 00 | |
| Miscellaneous items for the House of Representatives | 29,000 00 | 29,000 00 | |
| Principal and assistant librarian and messengers | 4,500 00 | 4,500 00 | |
| Purchase of books for the Library of Congress | 1,500 00 | 1,500 00 | |
| Purchase of law books for the Library of Congress | 2,500 00 | 2,500 00 | |
| Contingent expenses for the Library of Congress | 700 00 | 700 00 | |
| Compensation of coal and fireman, for furnaces to warm the Library of Congress | 600 00 | 600 00 | |
| Paper, printing, and binding, a complete Catalogue of the Library of Congress | 4,000 00 | 4,000 00 | |
| For 24 copies of the Congressional Globe and Appendix for each member and delegate of 1st session 35th Congress | 34,704 00 | 34,704 00 | |
| For binding 24 copies of the Congressional Globe and Appendix for each member and delegate of 1st session 35th Congress | 16,657 92 | 16,657 92 | |
| For binding 24 copies of the Congressional Globe and Appendix for each member and delegate of 1st session 34th Congress | 129 42 | 129 42 | |
| For binding 24 copies of the Congressional Globe and Appendix for each member and delegate of 2d session 34th Congress | 347 25 | 347 25 | |
| For 100 copies of the Congressional Globe and Appendix and binding the same, for the 1st and 2d sessions of 34th Congress, for the House Library | 2,559 00 | 2,559 00 | |
| For 100 copies of the Congressional Globe and Appendix and binding the same, for the 1st session 35th Congress, for the House Library | 2,000 00 | 2,000 00 | |
| To supply a deficiency in the appropriation for books for members of the 33d Congress | 1,479 97 | 1,479 97 | |

## No. 2—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation of the clerks, &c., in office of Commissioner of Customs | $8,749 63 | $8,749 63 | ---------- |
| Blanks books, &c., in office of the Commissioner of Customs | 3,297 63 | 3,297 63 | ---------- |
| Compensation of the Secretary of War | 4,000 00 | 4,000 00 | ---------- |
| Compensation of the clerks, &c., in office of the Secretary of War | 7,700 00 | 7,700 00 | ---------- |
| Compensation of the extra clerks in office of the Secretary of War | 3,110 43 | 3,110 43 | ---------- |
| Blank books &c., in office of the Secretary of War | 1,676 19 | 1,676 19 | ---------- |
| Compensation of the clerks, &c., in the office of Paymaster General | 5,761 86 | 5,761 86 | ---------- |
| Compensation of the clerks, &c., in the office of Commissary General of Subsistence | 5,020 00 | 5,020 00 | ---------- |
| Blank books, &c., in the office of Commissary General of Subsistence | 5,300 06 | 5,300 06 | $3,000 00 |
| Blank books, &c., in the office of Paymaster General | 250 00 | 250 00 | ---------- |
| Blank books, &c., in the office of Adjutant General | 2,009 04 | 2,009 04 | ---------- |
| Compensation of the clerks, &c., in the office of Adjutant General | 7,420 00 | 7,420 00 | ---------- |
| Blank books, &c., in the office of Chief Engineer | 360 47 | 360 47 | ---------- |
| Compensation of the clerks, &c., in the office of Chief Engineer | 4,220 00 | 4,220 00 | ---------- |
| Compensation of the clerks, &c., in the office of Quartermaster General | 10,749 90 | 10,749 90 | ---------- |
| Blank books, &c., in the office of Quartermaster General | 281 94 | 281 94 | ---------- |
| Blank books, &c., in the Topographical Bureau | 1,439 69 | 1,439 69 | ---------- |
| Compensation of the clerks, &c., in the Topographical Bureau | 4,520 00 | 4,520 00 | ---------- |
| Miscellaneous items in the Topographical Bureau | 300 00 | 300 00 | ---------- |
| Compensation of the clerks, &c., in the office of the Colonel of Ordnance | 6,120 00 | 6,120 00 | ---------- |
| Blank books, &c., in the office of the Colonel of Ordnance | 462 81 | 462 81 | ---------- |
| Miscellaneous items in the office of the Colonel of Ordnance | 200 69 | 200 69 | ---------- |
| Compensation of the clerks, &c., in the office of the Surgeon General | 2,620 00 | 2,620 00 | ---------- |
| Blank books, &c., in the office of the Surgeon General | 65 40 | 65 40 | ---------- |
| Miscellaneous items in the office of the Surgeon General | 32 69 | 32 69 | ---------- |

| | | | |
|---|---|---|---|
| Blank books, &c., office of Superintendent of Public Printing | 842 36 | 842 36 | ---------- |
| Compensation of the President of the United States | 14,088 76 | 10,416 67 | 3,672 09 |
| Compensation of the Vice President of the United States | 4,000 00 | 3,333 00 | 667 00 |
| Compensation of the secretary to sign patents for public lands | 989 50 | 375 00 | 614 50 |
| To provide suitable protection for the fuel consumed in southeast executive building | 2,000 00 | ---------- | 2,000 00 |
| Compensation of the First Comptroller | 1,750 00 | 1,750 00 | ---------- |
| Compensation of clerks, &c., in office of the First Comptroller | 12,431 61 | 12,431 61 | ---------- |
| Blank books, &c., in office of the First Comptroller | 400 00 | 400 00 | ---------- |
| Compensation of the Second Comptroller | 1,500 00 | 1,500 00 | ---------- |
| Compensation of the clerks, &c., in office of Second Comptroller | 12,089 56 | 11,920 00 | 169 56 |
| Blank books, &c., in office of the Second Comptroller | 200 00 | 200 00 | ---------- |
| Compensation of the First Auditor | 1,500 00 | 1,500 00 | ---------- |
| Compensation of the clerks, &c., in office of First Auditor | 16,470 00 | 16,470 00 | ---------- |
| Blank books, &c., in office of First Auditor | 259 73 | 259 73 | ---------- |
| Compensation of the Second Auditor | 1,500 00 | 1,500 00 | ---------- |
| Compensation of clerks, &c., in office of Second Auditor | 16,837 97 | 16,837 97 | ---------- |
| Blank books, &c., in office of Second Auditor | 1,100 00 | 1,100 00 | ---------- |
| Compensation of Third Auditor | 1,500 00 | 1,500 00 | ---------- |
| Compensation of clerks, &c., in office of Third Auditor | 68,030 71 | 68,030 71 | ---------- |
| Blank books, &c., in office of Third Auditor | 3,929 12 | 3,929 12 | ---------- |
| Compensation of the Fourth Auditor | 1,500 00 | 1,500 00 | ---------- |
| Compensation of the clerks, &c., in office of the Fourth Auditor | 12,387 04 | 12,387 04 | ---------- |
| Blank books, &c , in office of the First Auditor | 850 00 | 850 00 | ---------- |
| Compensation of the Fifth Auditor of the Treasury | 1,500 00 | 1,500 00 | ---------- |
| Compensation of clerks, &c , in office of the Fifth Auditor | 7,414 00 | 7,414 00 | ---------- |
| Blank books, &c., in office of Fifth Auditor | 69 66 | 69 66 | ---------- |
| Compensation of the Treasurer of the United States | 1,500 00 | 1,500 00 | ---------- |
| Compensation of the clerks, &c., in office of Treasurer United States | 11,478 70 | 11,478 70 | ---------- |
| Blank books, &c, in office of the Treasurer of United States | 1,461 07 | 1,461 07 | ---------- |
| Compensation of the Register of the Treasury | 1,500 00 | 1,500 00 | ---------- |
| Compensation of the clerks, &c , in the office of the Register of the Treasury | 23,850 45 | 23,850 45 | ---------- |
| Compensation of the clerks, &c , in the Light-house Board | 4,620 00 | 4,620 00 | ---------- |
| Blank books, &c., in office of Light-house Board | 187 50 | 187 50 | ---------- |
| Blank books, &c., in the office of the Register of the Treasury | 6,379 18 | 6,379 18 | ---------- |
| Blank books, &c., in the office of the Solicitor of the Treasury | 4,365 53 | 2,500 00 | 1,865 53 |
| Compensation of the Solicitor of the Treasury | 1,750 00 | 1,750 00 | ---------- |
| Compensation of the clerks, &c., in office of the Solicitor of the Treasury | 6,831 62 | 6,831 62 | ---------- |
| Statutes and law reports, &c., in office of Solicitor of the Treasury | 817 28 | 817 28 | ---------- |
| Compensation of the Commissioner of Customs | 1,500 00 | 1,500 00 | ---------- |

## No. 2—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation of the clerks, &c., in office of Commissioner of Customs | $8,749 63 | $8,749 63 | |
| Blanks books, &c., in office of the Commissioner of Customs | 3,297 63 | 3,297 63 | |
| Compensation of the Secretary of War | 4,000 00 | 4,000 00 | |
| Compensation of the clerks, &c., in office of the Secretary of War | 7,700 00 | 7,700 00 | |
| Compensation of the extra clerks in office of the Secretary of War | 3,110 43 | 3,110 43 | |
| Blank books &c., in office of the Secretary of War | 1,676 19 | 1,676 19 | |
| Compensation of the clerks, &c., in the office of Paymaster General | 5,761 86 | 5,761 86 | |
| Compensation of the clerks, &c., in the office of Commissary General of Subsistence | 5,020 00 | 5,020 00 | |
| Blank books, &c., in the office of Commissary General of Subsistence | 5,300 06 | 5,300 06 | $3,000 00 |
| Blank books, &c., in the office of Paymaster General | 250 00 | 250 00 | |
| Blank books, &c., in the office of Adjutant General | 2,009 04 | 2,009 04 | |
| Compensation of the clerks, &c., in the office of Adjutant General | 7,420 00 | 7,420 00 | |
| Blank books, &c., in the office of Chief Engineer | 360 47 | 360 47 | |
| Compensation of the clerks, &c., in the office of Chief Engineer | 4,220 00 | 4,220 00 | |
| Compensation of the clerks, &c., in the office of Quartermaster General | 10,749 90 | 10,749 90 | |
| Blank books, &c., in the office of Quartermaster General | 281 94 | 281 94 | |
| Blank books, &c., in the Topographical Bureau | 1,439 69 | 1,439 69 | |
| Compensation of the clerks, &c., in the Topographical Bureau | 4,520 00 | 4,520 00 | |
| Miscellaneous items in the Topographical Bureau | 300 00 | 300 00 | |
| Compensation of the clerks, &c., in the office of the Colonel of Ordnance | 6,120 00 | 6,120 00 | |
| Blank books, &c., in the office of the Colonel of Ordnance | 462 81 | 462 81 | |
| Miscellaneous items in the office of the Colonel of Ordnance | 200 69 | 200 69 | |
| Compensation of the clerks, &c., in the office of the Surgeon General | 2,620 00 | 2,620 00 | |
| Blank books, &c., in the office of the Surgeon General | 65 40 | 65 40 | |
| Miscellaneous items in the office of the Surgeon General | 32 69 | 32 69 | |

| | | | |
|---|---|---|---|
| Compensation of two laborers in the Northwest Executive building | 60 00 | 60 00 | ---------- |
| Fuel, lights, &c., in the Northwest Executive building | 1,207 50 | 1,207 50 | ---------- |
| Compensation of four watchmen and two laborers in Northwest Executive building | 1,950 00 | 1,950 00 | ---------- |
| Compensation of superintendent and four watchmen and two laborers in building corner of F and 17th streets | 1,925 00 | 1,925 00 | ---------- |
| Fuel and compensation of firemen in building corner of F and 17th streets | 2,014 37 | 2,014 37 | ---------- |
| Repairs and improvements in building corner of F and 17th streets | 527 39 | 527 39 | ---------- |
| Contingent expenses in building corner of F and 17th streets | 55 40 | 55 40 | ---------- |
| Compensation of the Secretary of the Navy | 4,000 00 | 4,000 00 | ---------- |
| Compensation of the clerks, &c., in office of Secretary of the Navy | 10,800 00 | 10,800 00 | ---------- |
| Blank books, &c., in office of Secretary of the Navy | 9,360 00 | 2,500 00 | 6,860 00 |
| Compensation of the clerks, &c., in Bureau of Ordnance and Hydrography | 4,420 00 | 4,420 00 | ---------- |
| Compensation of the chief of the Bureau of Ordnance and Hydrography | 2,206 72 | 1,750 00 | 556 72 |
| Blank books, &c., in the Bureau of Ordnance and Hydrography | 1,700 00 | ---------- | 1,700 00 |
| Miscellaneous items in the Bureau of Ordnance and Hydrography | 500 00 | ---------- | 500 00 |
| Compensation of the chief of the Bureau of Navy Yards and Docks | 1,750 00 | 1,750 00 | ---------- |
| Civil engineer, clerks, &c., in the Bureau of Navy Yards and Docks | 13,437 45 | 5,320 00 | 8,117 45 |
| Stationery, books, plans, &c , in the Bureau of Navy Yards and Docks | 2,400 00 | 400 00 | 2,000 00 |
| For labor in the Bureau of Navy Yards and Docks | 360 00 | ---------- | 360 00 |
| Chief naval constructor, engineer-in-chief, and clerks, &c., in Bureau of Construction, Equipment, and Repair | 11,145 14 | 8,920 00 | 2,225 14 |
| Compensation of the chief of Bureau of Construction, Equipment, and Repair | 1,750 00 | 1,750 00 | ---------- |
| Blank books, &c., in Bureau of Construction, Equipment, and Repair | 2,400 00 | 600 00 | 1,800 00 |
| For labor in Bureau of Construction, Equipment, and Repair | 300 00 | ---------- | 300 00 |
| Compensation of clerks, &c., in Bureau of Provisions and Clothing | 4,420 00 | 4,420 00 | ---------- |
| Blank books, &c., in Bureau of Provisions and Clothing | 2,070 00 | 500 00 | 1,570 00 |
| Blank books, &c., in Bureau of Medicine and Surgery | 800 00 | ---------- | 800 00 |
| Labor in Bureau of Medicine and Surgery | 180 00 | ---------- | 180 00 |
| Miscellaneous items in Bureau of Medicine and Surgery | 200 00 | ---------- | 200 00 |
| Compensation of the chief of Bureau of Medicine and Surgery | 1,750 00 | 1,750 00 | ---------- |
| Compensation of the clerks, &c., in Bureau of Medicine and Surgery | 3,824 85 | 3,020 00 | 804 85 |
| Compensation of four watchmen in the Southwest Executive building | 1,200 00 | 1,200 00 | ---------- |
| Labor, fuel, and lights in the Southwest Executive building | 1,063 00 | 1,063 00 | ---------- |
| Compensation of the Postmaster General | 4,000 00 | 4,000 00 | ---------- |
| Compensation of Assistant Postmasters General | 4,500 00 | 4,500 00 | ---------- |
| Compensation of the clerks, &c., in office of Postmaster General | 70,172 92 | 70,172 92 | ---------- |
| Blank books, &c., in office of Postmaster General | 4,000 00 | 4,000 00 | ---------- |
| Repairs of the General Post Office building | 1,500 00 | 1,500 00 | ---------- |
| Renewal of the furnaces in the General Post Office building | 100 00 | ---------- | 100 00 |

## No. 2—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation of the Auditor of the Post office department | $1,500 00 | $1,500 00 | ..... |
| Compensation of the clerks, &c., in office of Auditor of the Post Office Department | 77,676 52 | 77,676 52 | ..... |
| Labor, stationery, blank books, &c , in office of Auditor of the Post Office Department | 17,277 19 | 17,277 19 | ..... |
| Miscellaneous items in office of Auditor of the Post Office Department | 1,685 77 | 1,685 77 | ..... |
| Salaries of assistant treasurers | 16,369 32 | 10,369 32 | $6,000 00 |
| Salaries of ten additional clerks under act 6th August, 1846 | 6,139 10 | 6,139 10 | ..... |
| Paper and printing 'or the Executive Departments | 18,204 48 | 18,204 48 | ..... |
| Salaries of clerks, &c., in office of assistant treasurer, New York | 8,266 84 | 6,950 00 | 1,316 84 |
| Salary of a clerk to the treasurer of the branch mint at San Francisco | 3,541 67 | 1,041 67 | 2,500 00 |
| Salaries of officers and clerks of the mint at Philadelphia | 13,950 00 | 13,950 00 | ..... |
| Salaries of officers and clerks of the branch mint at Charlotte | 4,500 00 | 3,000 00 | 1,500 00 |
| Salaries of officers and clerks of the branch mint at Dahlonega | 3,700 00 | 3,000 00 | 700 00 |
| Salaries of officers and clerks of the branch mint at New Orleans | 9,150 00 | 9,150 00 | ..... |
| Salaries of officers and clerks of the branch mint at San Francisco | 13,211 67 | 11,666 67 | 1,545 00 |
| Salaries of officers and clerks of the assay office at New York | 28,300 00 | 24,700 00 | 3,600 00 |
| Salary of circuit judge for California | 3,362 50 | 1,500 00 | 1,862 50 |
| Chief justice, associate and district judges of the United States | 299 63 | ..... | 299 63 |
| Compensation and mileage of the members of the legislative assembly of Oregon Territory | 11,707 31 | 11,707 31 | ..... |
| Contingent expenses of the Territory of Oregon | 1,677 20 | 1,677 20 | ..... |
| Compensation and mileage of the members, &c., of Territory of Utah | 52,754 72 | 32,754 72 | 20,000 00 |
| Compensation and mileage of the members, &c., of Territory of Washington | 5,000 00 | 5,000 00 | ..... |
| Contingent expenses of the Territory of Washington | 141 24 | 141 24 | ..... |
| Compensation and mileage of the members, &c., of Territory of Kansas | 7,000 00 | 7,000 00 | ..... |
| Compensation and mileage of the members, &c., of Territory of Wisconsin | 309 11 | ..... | 309 11 |
| Salaries of three judges of the Court of Claims, the solicitor, deputy clerk, &c. | 15,142 12 | 15,142 12 | ..... |

| | | | |
|---|---|---|---|
| Fees of witnesses in behalf of the government in the Court of Claims | 3,500 00 | 3,500 00 | ---------- |
| Salaries of two clerks in the Court of Claims | 1,217 03 | 1,317 03 | ---------- |
| Stationery, fuel, gas, labor, &c., for Court of Claims | 1,500 00 | 1,500 00 | ---------- |
| Fitting up and furnishing the court rooms and conference room and offices, &c., of Court of Claims | 500 00 | 500 00 | ---------- |
| Compensation of the Attorney General | 4,000 14 | 4,000 14 | ---------- |
| Compensation of the clerks, &c., in office of Attorney General | 5,955 23 | 5,955 23 | ---------- |
| Fuel and labor for the office of the Attorney General | 200 00 | 200 00 | ---------- |
| Purchase of Mexican and Spanish law books for office of Attorney General | 47 75 | 47 75 | ---------- |
| Rent of building occupied by Attorney General and First Auditor | 1,422 07 | 1,422 07 | ---------- |
| Laborers at the building occupied by the Attorney General and First Auditor | 248 26 | 248 26 | ---------- |
| Chief justice and associate judges of the Supreme Court | 28,750 00 | 15,125 00 | 13,625 00 |
| Chief justice and associate judges of the Orphans' and Criminal Courts of the District of Columbia | 8,688 23 | 3,937 50 | 4,750 73 |
| Governor, judges, and secretary of Oregon Territory | 9,035 82 | 5,910 82 | 3,125 00 |
| Governor, judges, and secretary of Utah Territory | 14,994 57 | 11,994 57 | 3,000 00 |
| Governor, judges, and secretary of New Mexico Territory | 17,040 76 | 13,915 16 | 3,125 50 |
| Governor, judges, and secretary of Washington Territory | 7,540 48 | 4,415 48 | 3,125 00 |
| To employ an interpreter or translator for the Territory of New Mexico | 500 00 | 500 00 | ---------- |
| Compensation and mileage of members, &c., for the Territory of New Mexico | 27,085 90 | 27,085 90 | ---------- |
| Contingent expenses for the Territory of New Mexico | 293 03 | 293 03 | ---------- |
| Governor, judges, and secretary of the Territory of Minnesota | 5,474 45 | 5,474 45 | ---------- |
| Governor, judges, and secretary of the Territory of Nebraksa | 9,238 17 | 6,613 17 | 2,625 00 |
| Compensation and mileage of the members, &c., of the Territory of Nebraska | 20,537 09 | 20,537 09 | ---------- |
| Compensation and mileage of the members, &c., of the Territory of Minnesota | 23,973 71 | 23,973 71 | ---------- |
| Salaries and expenses of nine supervising and fifty local inspectors of steamboats, &c. | 47,328 56 | 27,328 56 | 20,000 00 |
| Salaries of district attorneys of the United States | 10,260 57 | 7,385 57 | 2,875 00 |
| Salaries of marshals of the United States | 9,424 16 | 7,174 16 | 2,250 00 |
| Salaries of district judges of the United States | 51,657 38 | 26,357 38 | 25,300 00 |
| Compensation of governor, judges, and secretary of the Territory of Kansas | 6,589 32 | 3,964 32 | 2,625 00 |
| To render the mint at Philadelphia fire-proof, &c | 572 14 | ---------- | 572 14 |
| To the purchase of new fixtures and machinery for the mint at Philadelphia | 5,126 61 | ---------- | 5,126 61 |
| Incidental and contingent expenses, including wastage, &c., for the mint at Philadelphia | 37,500 00 | 37,500 00 | ---------- |
| Wages of workmen at the mint at Philadelphia | 37,400 00 | 37,400 00 | ---------- |
| Specimens of ores and coins to be reserved at the mint at Philadelphia | 300 00 | 300 00 | ---------- |
| Wages of workmen at branch mint at Charlotte | 6,241 00 | 2,741 00 | 3,500 00 |
| For the construction of a new roof at branch mint at Charlotte | 2,352 23 | ---------- | 2,352 23 |
| Wastage and contingent expenses at branch mint at Charlotte | 6,246 20 | 3,246 20 | 3,000 00 |
| Wages of workmen at the branch mint at Dahlonega | 3,333 53 | 1,933 53 | 1,400 00 |
| Wastage and contingent expenses of branch mint at Dahlonega | 13,195 22 | 6,420 00 | 6,775 22 |
| Wages of workmen at the branch mint at New Orleans | 26,982 45 | 20,982 45 | 6,000 00 |

## No. 2—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Incidental and contingent expenses of the branch mint at New Orleans | $18,642 55 | $12,642 55 | $6,000 00 |
| Rebuilding the walls, and complete repairs of the buildings, &c., of the branch mint at New Orleans | 49,931 49 | 30,000 00 | 19,931 49 |
| Wages of workmen at the branch mint at San Francisco | 72,916 67 | 72,916 67 | |
| Incidental and contingent expenses at branch mint at San Francisco | 25,644 57 | 7,644 57 | 18,000 00 |
| Establishing the branch mint at San Francisco | 45,000 00 | | 45,000 00 |
| Wages of workmen in the assay office | 43,700 00 | 22,700 00 | 21,000 00 |
| Transportation of bullion from the New York assay office to Philadelphia mint | 5,000 00 | 5,000 00 | |
| Incidental and contingent expenses of the assay office, New York | 20,000 00 | 11,000 00 | 9,000 00 |
| For a site and building for the accommodation of United States courts at city of Baltimore | 199,888 00 | | 199,888 00 |
| For the public buildings for the Territory of New Mexico | 13 61 | | 13 61 |
| For the purchase of a site and erection of a penitentiary at New Mexico | 12 73 | | 12 73 |
| For the accommodation of the United States courts for the southern district of Florida at Key West | 37,958 26 | | 37,958 26 |
| For the preservation of the archives of the Territory of New Mexico | 175 13 | | 175 13 |
| For the accommodation of the United States courts, &c., at Rutland, Vermont | 50,573 25 | 30,000 00 | 20,573 25 |
| For ten per cent. on the accommodation of the United States courts, &c., at Rutland, Vermont | 4,189 87 | 1,000 00 | 3,189 87 |
| For the erection of a temporary capitol for Washington Territory, &c | 30,000 00 | 10,000 00 | 20,000 00 |
| For the erection of a penitentiary for Washington Territory | 20,000 00 | 10,000 00 | 10,000 00 |
| For the continuation of the public buildings for the Territory of Minnesota | 226 66 | 226 66 | |
| For the purchase of a site for a post office at Rutland, Vermont | | | |
| For a building for a court-house and post office at Raleigh, North Carolina | 49,956 02 | | 49,956 02 |
| Do do do Columbia, South Carolina | 49,980 00 | | 49,980 00 |
| Do do do Madison, Wisconsin | 50,000 00 | | 50,000 00 |
| Do do do Memphis, Tennessee | 49,961 10 | | 49,961 10 |
| Do do do Tallahassee, Florida | 49,963 90 | | 49,963 90 |
| Do do do Indianapolis, Indiana | 90,844 30 | | 90,844 30 |

| | | | |
|---|---|---|---|
| Redemption of United States 5 per cent. stock, issued for payment of the 4th and 5th instalments of the Mexican indemnity | 1,104 91 | | 1,104 91 |
| Payment of interest on the Mexican indemnity | 311 11 | | 311 11 |
| | 6,777,894 91 | 3,999,478 09 | 2,778,416 82 |

## No. 2—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amount (estimated) that may be required for the service of the government to June 30, 1858. | Amount (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| To make good the interest on the investment in stocks of the State of Arkansas, held in trust for the Chickasaw Indians, &c. | $5,400 00 | $5,400 00 | ---------- |
| Expenses incident to loans and treasury notes | 2,000 00 | 2,000 00 | ---------- |
| Expenses of engraving, printing, &c., treasury notes, act of 23d December, 1857 | 20,000 00 | 20,000 00 | ---------- |
| For purchasing a site and erection of a building for a post office in the city of New York | 500,000 00 | ---------- | $500,000 00 |
| For purchasing a site and erection of a building for a post office in the city of Baltimore | 92,698 00 | 70,000 00 | 22,698 00 |
| For making alterations required in the building purchased of the Bank of Pennsylvania to adapt it to the uses of a post office in Philadelphia, &c | 141,624 39 | 5,000 00 | 136,624 39 |
| For furnishing the post office at Bangor, Maine | 103 29 | 103 29 | ---------- |
| To supply any deficiency that may arise in the Post Office Department | 718,000 00 | 718,000 00 | ---------- |
| For continuation of the treasury building | 392,596 53 | 150,000 00 | 242,596 53 |
| For the purchase of a lot and building for the use of the United States courts at Philadelphia | 78,000 00 | ---------- | 78,000 00 |
| For lighting and ventilating the upper story of the treasury building, &c | 13,092 50 | 1,500 00 | 11,592 50 |
| For the suppression of the slave trade | 11,466 67 | 5,000 00 | 6,466 67 |
| To cause experiments and analyses of different ore beds to be made to test their use, to obtain the most suitable iron for the public works | 2,419 74 | 1,000 00 | 1,419 74 |
| To procure a bust in marble of the late Chief Justice John Rutledge | 800 00 | 800 00 | ---------- |
| For preventing the abrasion and counterfeiting, &c., of the coins of the United States | 2,500 00 | 2,500 00 | ---------- |
| For redemption of bounty land stock | 9,375 00 | 1,375 00 | 8,000 00 |
| For interest on bounty land stock | 2,822 86 | 322 86 | 2,500 00 |
| For interest on treasury notes | 1,893 06 | ---------- | 1,893 06 |
| Relief of Thomas S. J. Johnson | 131 63 | 131 63 | ---------- |
| Relief of J. R. Bowers and Isaac S. Smith | 18 01 | 18 01 | ---------- |
| Payment to such creditors of Texas as are comprehended in act of 9th of September, 1850 | 263,497 84 | 200,000 00 | 63,497 84 |

| | | | |
|---|---|---|---|
| Redemption of United States 5 per cent. stock, issued for payment of the 4th and 5th instalments of the Mexican indemnity | 1,104 91 | ..... | 1,104 91 |
| Payment of interest on the Mexican indemnity | 311 11 | ..... | 311 11 |
| | 6,777,894 91 | 3,999,478 09 | 2,778,416 82 |

## No. 3.

*Balances of appropriations on January* 22, 1858, *in relation to customs, the amounts (estimated) that may be required for the service of the government to June* 30, 1858, *and the amounts (estimated) applicable to the service of the fiscal year ending June* 30, 1859.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Expenses of collecting the revenue from customs | $930,401 87 | $930,401 87 | ---------- |
| Supplying light-houses with oil, &c | 189,533 53 | 130.000 00 | $59,533 53 |
| Repairs and incidental expenses, &c., of light-houses, &c | 34,070 14 | 30,000 00 | 4,070 14 |
| Salaries of light-house keepers, &c | 281,106 72 | 90,000 00 | 191,106 72 |
| Salaries of keepers of light-boats, &c | 25,404 78 | 14,000 00 | 11,404 78 |
| Seamen's wages, repairs, &c., of light-boats, &c | 126,893 03 | 80,000 00 | 46,893 03 |
| Expenses of weighing, mooring, &c., beacons, &c | 81,275 67 | 40,000 00 | 41,275 67 |
| Commissions of 2½ per cent. to superintendents, &c | 15,119 35 | 3,000 00 | 12,119 35 |
| Annual repairs, &c., of custom-houses, &c., of the United States | 29,962 05 | 20,000 00 | 9,962 05 |
| Expenses of superintendents in visiting light-houses, &c | 3,030 33 | 500 00 | 2,530 33 |
| Fuel and quarters for officers of the army serving on light-house duty | 6,409 61 | 3,500 00 | 2,909 61 |
| Custom-house, &c., at Portland, Maine | 452 17 | 452 17 | ---------- |
| Custom-house, &c., at St. Louis, Missouri | 66,651 29 | 66,651 29 | ---------- |
| Custom-house, &c., at Providence, Rhode Island | 26,891 92 | 26,891 92 | ---------- |
| Warehouses. at quarantine station, below New Orleans, &c | 50,000 00 | ---------- | 50,000 00 |
| Custom-house at the city of Bangor, Maine | 488 57 | 488 57 | ---------- |
| the city of Bangor, Maine; bridging the Kenduskeag river, &c | 5,300 00 | ---------- | 5,300 00 |
| Charleston, South Carolina | 355,464 81 | 100,000 00 | 255,464 81 |
| Norfolk, Virginia | 12,765 85 | 12,765 85 | ---------- |
| San Francisco, California | 18,344 44 | ---------- | 18,344 44 |

| | | | |
|---|---|---|---|
| Knoxville, Tennessee, ten per cent. contingencies, &c | 8,603 69 | | 8,603 69 |
| Perth Amboy, New Jersey | 20,000 00 | | 20,000 00 |
| Perth Amboy, New Jersey, ten per cent. contingencies, &c | 1,057 90 | | 1,057 90 |
| Cairo, Illinois | 50,000 00 | | 50,000 00 |
| For a small class revenue cutter, to be located in the collection district of Key West, Florida, &c | 500 00 | 500 00 | |
| Purchase or otherwise, a suitable steamer as a revenue cutter, &c | 45,000 00 | 45,000 00 | |
| Additional revenue cutters, &c | 391 68 | 391 68 | |
| Revenue cutters to be built for the protection of the revenue on the lakes, &c | 17,862 13 | 17,862 13 | |
| Construction of an appraiser's store for the custom-house at San Francisco, California | 6,433 25 | | 6,433 25 |
| Annual repairs of marine hospitals | 27,574 48 | 20,000 00 | 7,574 48 |
| Marine hospital at New Orleans, Louisiana | 271,790 52 | 75,000 00 | 196,790 52 |
| New Orleans, Louisiana, ten per cent. contingencies, &c | 13,079 06 | 1,500 00 | 11,579 06 |
| Detroit, Michigan | 13,715 86 | 1,300 00 | 12,415 86 |
| Detroit, Michigan, ten per cent. contingencies, &c | 366 64 | 100 00 | 266 64 |
| Pensacola, Florida | 19,179 80 | | 19,179 80 |
| Pensacola, Florida, ten per cent. contingencies, &c | 1,767 24 | | 1,767 24 |
| Evansville, Indiana | 4,838 15 | 4,838 15 | |
| Evansville, Indiana, fencing and grading the site, &c | 5,500 00 | 5,500 00 | |
| Chicago, Illinois | 198 33 | 198 33 | |
| Paducah, Kentucky | 7,109 38 | 7,109 38 | |
| Vicksburg, Mississippi | 1,218 48 | 1,218 48 | |
| St. Mark's, Florida | 13,260 29 | 13,260 29 | |
| Cincinnati, Ohio | 31,050 47 | 31,050 47 | |
| Portland, Maine | 2,260 12 | 2,260 12 | |
| Paducah, Kentucky, draining site, &c | 2,000 00 | 2,000 00 | |
| Burlington, Vermont | 1,186 23 | 1,186 23 | |
| Wilmington, North Carolina | 40,000 00 | 20,000 00 | 20,000 00 |
| Wilmington, North Carolina, ten per cent. contingencies, &c | 3,283 67 | 500 00 | 2,783 67 |
| Galena, Illinois | 23,313 82 | 20,000 00 | 3,313 82 |
| Purchase of metallic surf boats to rescue lives, &c., on the lakes | 23 55 | 23 55 | |
| Life-boats, &c., on the coast of the United States | 107 30 | 107 30 | |
| Enclosing, grading, &c., the site of the marine hospital at Mobile, Alabama | 5,404 00 | 5,401 00 | |
| Fencing and grading the grounds of marine hospital at St. Louis, Missouri | 26,300 00 | 26,300 00 | |
| Unclaimed merchandise | 89,106 58 | 89,106 58 | |
| Light-house at Dry Point, on Linkins' Neck, Maine | 2,916 80 | | 2,916 80 |
| Light house on or near Widow's island, Maine | 7,500 00 | 1,500 00 | 6,000 00 |
| Rebuilding Brown's Head light-house, &c | 500 00 | 500 00 | |
| Rebuilding suitable tower and keeper's dwelling, &c., at Martinicus, Maine | 15,141 50 | 15,141 50 | |
| Rebuilding the light-house, &c., at West Quoddy Head, Maine | 836 10 | 836 10 | |

## No. 3—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Custom-house, &c., at Petersburg, Virginia | $48,696 20 | $35,000 00 | $13,696 20 |
| Petersburg, Virginia, ten per cent. contingencies, &c | 1,485 61 | 1,000 00 | 485 61 |
| Astoria, Oregon | 39,938 43 | | 39,938 43 |
| Bristol, Rhode Island | 733 80 | 733 80 | |
| Bristol, Rhode Island, ten per cent. contingencies, &c | | | |
| Pensacola, Florida | 4,317 83 | 4,317 83 | |
| Cleveland, Ohio | 65,527 33 | 50,000 00 | 15,527 33 |
| Cleveland, Ohio, ten per cent. contingencies, &c | 6,930 32 | 1,200 00 | 5,730 32 |
| Plattsburg, New York | 6,303 76 | 6,303 76 | |
| Plattsburg, New York, ten per cent. contingencies, &c | 1,386 01 | 1,000 00 | 386 01 |
| Alexandria, Virginia | 28,179 69 | 25,000 00 | 3,179 69 |
| Alexandria, Virginia, ten per cent. contingencies, &c | 983 41 | 983 41 | |
| Galena, Illinois | 39,634 08 | 39,634 08 | |
| Galena, Illinois, ten per cent. contingencies, &c | 2,986 48 | 1,000 00 | 1,986 48 |
| Portsmouth, New Hampshire | 85,013 00 | 50,000 00 | 35,013 00 |
| Portsmouth, New Hampshire, ten per cent. contingencies, &c | 4,279 19 | 1,000 00 | 3,279 19 |
| Nashville, Tennessee | 95,000 00 | | 95,000 00 |
| Nashville, Tennessee, ten per cent. contingencies, &c | 9,248 69 | | 9,248 69 |
| Ogdensburg, New York | 100,000 00 | | 100,000 00 |
| Ogdensburg, New York, ten per cent. contingencies, &c | 9,066 25 | | 9,066 25 |
| Georgetown, District of Columbia | 24,343 99 | 20,000 00 | 4,343 99 |
| Georgetown, District of Columbia, ten per cent. contingencies, &c | 2,583 03 | 1,000 00 | 1,583 03 |
| Dubuque, Iowa | 98,800 00 | 50,000 00 | 48,800 00 |
| Dubuque, Iowa, ten per cent. contingencies, &c | 8,450 65 | 1,200 00 | 7,250 65 |
| Knoxville, Tennessee | 88,000 00 | | 88,000 00 |

| | | | |
|---|---|---|---|
| Protection of piers, &c., in Hudson river, upon which lights are placed, New York | 2 93 | | 2 93 |
| Light-house at or near Tarrytown Point, &c., New York | 7,000 00 | 1,000 00 | 6,000 00 |
| Preservation, &c., of light-house site at the mouth of the Genessee river, New York | 2,000 00 | | 2,000 00 |
| Contingencies of stations on the coasts of New York and New Jersey | 4,014 82 | 4,014 82 | |
| Rebuilding, &c , light-house at Fire island, &c., New York | 18,000 00 | 18,000 00 | |
| First-class light-house, &c., at Barnegat, &c., New Jersey | 19,818 99 | 10,000 00 | 9,818 99 |
| Rebuilding foundation of light-house, &c., at Bergen Point, New Jersey | 11,150 13 | 5,000 00 | 6,150 13 |
| Rebuilding foundation of light-house tower, &c., at Passaic, &c., New Jersey | 10,087 22 | 5,000 00 | 5,087 22 |
| Compensation of two superintendents for life stations of Long Island and New Jersey | 1,376 39 | 1,376 39 | |
| Compensation of fifty four keepers of life stations, &c., coast of New Jersey | 7,195 48 | 7,195 48 | |
| Rebuilding, &c., light-house at Cape May, &c., New Jersey | 40,000 00 | 15,000 00 | 25,000 00 |
| Light-house on or near Ship John shoals, Delaware | 25,922 39 | | 25,922 39 |
| Light-house on Fenwick's island, Delaware | 19,720 71 | 5,000 00 | 14,720 71 |
| Light-house at Cross Ledge, &c., Delaware | 48,004 90 | | 48,004 90 |
| Beacon-light on the pier at Port Penn, &c., Delaware | 406 35 | | 406 35 |
| Fog signals at Delaware breakwater light-house, &c., Delaware | 298 14 | | 298 14 |
| Light-house on Love Point, &c , Maryland | 13,997 69 | | 13,997 69 |
| Light-house at Drum Point, &c., Maryland | 3,814 59 | | 3,814 59 |
| Small beacon-light at or near Fort Washington, Maryland | 119 02 | | 119 02 |
| Buoys, &c., in the Great Choptank river, Maryland | 37 | | 37 |
| Beacon-light on the shore opposite Lyon's Creek shoal, &c., Maryland | 28 00 | | 28 00 |
| Forty-three buoys for buoying the kettle bottoms, &c., &c., Virginia | 13 28 | | 13 28 |
| Small pile light-house, near Stingray Point, &c., Virginia | 10,601 23 | | 10,601 23 |
| Buoys, &c., in the Potomac river, between Alexandria and Georgetown, Virginia | 1 07 | | 1 07 |
| Rebuilding Cape Charles light house, &c., Virginia | 24,087 05 | 12,000 00 | 12,087 05 |
| Rebuilding, &c., light-house at Pungoteague, &c , Virginia | 5,000 00 | 2,000 00 | 3,000 00 |
| Buoys, &c., in the Chesapeake bay, at Fisherman and Pickett's hole, &c , Virginia | 2 89 | | 2 89 |
| Jones' fog bells, Assateague and Cape Henry light-houses, &c., Virginia | 351 95 | | 351 95 |
| Fog bell near the light-house at Old Point Comfort, &c., &c., Virginia | 68 35 | | 68 35 |
| Beacon-light at Naylor's Hole, Rappahannock river, &c., Virginia | 103 75 | | 103 75 |
| Buoys in Matchipungo bay, Virginia | 1 70 | | 1 70 |
| Rebuilding, &c., light-house at Cape Lookout, North Carolina | 23,189 64 | 20,000 00 | 3,189 64 |
| Iron buoy on Diamond shoal, &c., North Carolina | 98 13 | | 98 13 |
| Rebuilding, &c., light-house at Body's island, North Carolina | 19,594 31 | 10,000 00 | 9,594 31 |
| Day beacon, &c., in St. Helena Sound, South Carolina | 43 06 | | 43 06 |
| Changing the light-house at Cape Romain, &c., South Carolina | 3 37 | | 3 37 |
| Light-house, &c., near Mount Pleasant, South Carolina | 2,265 38 | 2,265 38 | |
| Completing beacons, &c., on South Island Point, &c., South Carolina | 9,319 84 | 9,319 84 | |
| Light-house, &c., on Fort Point, &c., South Carolina | 5,587 22 | 5,587 22 | |

No. 3—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government for June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Beacon light to range with the Amelia Island light, &c., Georgia | $2,000 00 | $2 000 00 | ---------- |
| Beacon lights, &c., on or near north front of Amelia island, Georgia | 4,500 00 | 4,500 00 | ---------- |
| Bell buoy to mark entrance to Savannah River, &c., Georgia | 169 18 | 169 18 | ---------- |
| Bell buoy to mark the approach to the bar at Doboy, Georgia | 5,000 00 | 5,000 00 | ---------- |
| Small light on the bay, city of Savannah, Georgia | 1,278 48 | 1,278 48 | ---------- |
| Light-house, &c., near Jupiter inlet, Florida | 19,391 89 | ---------- | $19,391 89 |
| Bell buoy, mouth of St. John's river, Florida | 5,000 00 | 5,000 00 | ---------- |
| Light-vessel near Damis Point, &c., Florida | 9,500 00 | 9,500 00 | ---------- |
| Beacon lights at Piney Point, &c., Florida | 15,000 00 | 5,000 00 | 10,000 00 |
| Rebuilding light-house, &c., at Dry Tortugas, &c., Florida | 120 00 | 120 00 | ---------- |
| Light-house to mark the entrance to St. Andrew's bay, Florida | 14,282 32 | ---------- | 14,282 32 |
| Light-house at Pensacola, rebuilding, &c., Florida | 25,027 31 | 25,027 31 | ---------- |
| Light-house at Cape St. Blas, rebuilding, &c., Florida | 18,345 68 | 10 000 00 | 8,345 68 |
| Sea coast light, &c., on Sand island, Alabama | 16,808 37 | 16,808 37 | ---------- |
| Rebuilding light-house, &c., at Choctaw Point. &c., Alabama | 2,000 00 | 2,000 00 | ---------- |
| Rebuilding light-house, &c., at Round island, Mississippi | 8,000 00 | 1,000 00 | 7,000 00 |
| Rebuilding light house, &c., at Cat island, Mississippi | 11,282 32 | 1,000 00 | 10,282 32 |
| Light-house, &c., at or near the mouth of Amite river, &c., Louisiana | 6,000 00 | ---------- | 6,000 00 |
| Light-house, &c., on Southwest reef, &c., Louisiana | 19,150 13 | 1,000 00 | 18,150 13 |
| Light-house to mark the channel of the Grand Pass to Barataria bay, Louisiana | 9 12 | ---------- | 9 12 |
| Light-house, &c., at Ship shoal or Raccoon Point, &c., Louisiana | 37,440 25 | 37,440 25 | ---------- |
| Light-house, &c., on or near the head of the "Swash," &c., Texas | 5,280 97 | 5,280 92 | ---------- |
| Light-house, &c., at the mouth of the bayou at Salina, Texas | 398 40 | 398 40 | ---------- |
| Light-house, &c., at the mouth of the Rio Grande river, &c., Texas | 6,000 00 | 1,000 00 | 5,000 00 |
| Beacon light at Corpus Christi, &c., Texas | 5,000 00 | 1,000 00 | 4,000 00 |

| | | | |
|---|---|---|---|
| Protection of piers, &c., in Hudson river, upon which lights are placed, New York | 2 93 | | 2 93 |
| Light-house at or near Tarrytown Point, &c., New York | 7,000 00 | 1,000 00 | 6,000 00 |
| Preservation, &c., of light-house site at the mouth of the Genessee river, New York | 2,000 00 | | 2,000 00 |
| Contingencies of stations on the coasts of New York and New Jersey | 4,014 82 | 4,014 82 | |
| Rebuilding, &c , light-house at Fire island, &c., New York | 18,000 00 | 18,000 00 | |
| First-class light-house, &c., at Barnegat, &c., New Jersey | 19,818 99 | 10,000 00 | 9,818 99 |
| Rebuilding foundation of light-house, &c., at Bergen Point, New Jersey | 11,150 13 | 5,000 00 | 6,150 13 |
| Rebuilding foundation of light-house tower, &c., at Passaic, &c., New Jersey | 10,087 22 | 5,000 00 | 5,087 22 |
| Compensation of two superintendents for life stations of Long Island and New Jersey | 1,376 39 | 1,376 39 | |
| Compensation of fifty four keepers of life stations, &c., coast of New Jersey | 7,195 48 | 7,195 48 | |
| Rebuilding, &c., light-house at Cape May, &c., New Jersey | 40,000 00 | 15,000 00 | 25,000 00 |
| Light-house on or near Ship John shoals, Delaware | 25,922 39 | | 25,922 39 |
| Light-house on Fenwick's island, Delaware | 19,720 71 | 5,000 00 | 14,720 71 |
| Light-house at Cross Ledge, &c., Delaware | 48,004 90 | | 48,004 90 |
| Beacon-light on the pier at Port Penn, &c., Delaware | 406 35 | | 406 35 |
| Fog signals at Delaware breakwater light-house, &c., Delaware | 298 14 | | 298 14 |
| Light-house on Love Point, &c , Maryland | 13,997 69 | | 13,997 69 |
| Light-house at Drum Point, &c., Maryland | 3,814 59 | | 3,814 59 |
| Small beacon-light at or near Fort Washington, Maryland | 119 02 | | 119 02 |
| Buoys, &c., in the Great Choptank river, Maryland | 37 | | 37 |
| Beacon-light on the shore opposite Lyon's Creek shoal, &c., Maryland | 28 00 | | 28 00 |
| Forty-three buoys for buoying the kettle bottoms, &c., &c., Virginia | 13 28 | | 13 28 |
| Small pile light-house, near Stingray Point, &c., Virginia | 10,601 23 | | 10,601 23 |
| Buoys, &c., in the Potomac river, between Alexandria and Georgetown, Virginia | 1 07 | | 1 07 |
| Rebuilding Cape Charles light house, &c., Virginia | 24,087 05 | 12,000 00 | 12,087 05 |
| Rebuilding, &c., light-house at Pungoteague, &c , Virginia | 5,000 00 | 2,000 00 | 3,000 00 |
| Buoys, &c., in the Chesapeake bay, at Fisherman and Pickett's hole, &c , Virginia | 2 89 | | 2 89 |
| Jones' fog bells, Assateague and Cape Henry light-houses, &c., Virginia | 351 95 | | 351 95 |
| Fog bell near the light-house at Old Point Comfort, &c., &c., Virginia | 68 35 | | 68 35 |
| Beacon-light at Naylor's Hole, Rappahannock river, &c., Virginia | 103 75 | | 103 75 |
| Buoys in Matchipungo bay, Virginia | 1 70 | | 1 70 |
| Rebuilding, &c., light-house at Cape Lookout, North Carolina | 23,189 64 | 20,000 00 | 3,189 64 |
| Iron buoy on Diamond shoal, &c., North Carolina | 98 13 | | 98 13 |
| Rebuilding, &c., light-house at Body's island, North Carolina | 19,594 31 | 10,000 00 | 9,594 31 |
| Day beacon, &c., in St. Helena Sound, South Carolina | 43 06 | | 43 06 |
| Changing the light-house at Cape Romain, &c., South Carolina | 3 37 | | 3 37 |
| Light-house, &c., near Mount Pleasant, South Carolina | 2,265 38 | 2,265 38 | |
| Completing beacons, &c., on South Island Point, &c., South Carolina | 9,319 84 | 9,319 84 | |
| Light-house, &c., on Fort Point, &c., South Carolina | 5,587 22 | 5,587 22 | |

No. 3—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government for June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Light house at Minnesota Point, &c., Minnesota | $1,298 20 | $1,298 20 | ---------- |
| Light-house at Beaver bay, &c., Minnesota | 5,217 44 | 1,000 00 | $4,217 44 |
| Light-house at Grand Marais, &c., Minnesota | 6,000 00 | 1,000 00 | 5,000 00 |
| Machinery, &c., for testing Babbage's plan for distinguishing lights, &c. | 4,191 00 | ---------- | 4,191 00 |
| Screw pile light-house near the entrance to the channel of the Mississippi river and St. Louis | 38,700 03 | ---------- | 38,700 03 |
| Marine hospital establishment | 71,667 34 | 71,667 34 | ---------- |
| | 6,348,521 44 | 3,349,621 27 | 2,998,900 17 |

| | | | |
|---|---|---|---|
| Beacon light at Erie, Pennsylvania | 68 23 | | 68 23 |
| Light-house at La Point, Michigan | 4,100 00 | 4,100 00 | |
| Light-house on Traverse or Charity island, Michigan | 700 00 | 700 00 | |
| Light-house at the mouth of Au Sable river, &c., Michigan | 5,000 00 | 1,000 00 | 4,000 00 |
| Light-house at Fort Austin, &c., Michigan | 4,500 00 | 1,000 00 | 3,500 00 |
| Light-house on Point Peninsula, &c , Michigan | 5,000 00 | 1,000 00 | 4,000 00 |
| Lake coast light at Grand Point, Au Sable, Michigan | 5,118 54 | 1,000 00 | 4,118 54 |
| Additional buoys in Detroit River, &c., Michigan | 2,386 10 | 2,386 10 | |
| Light-house at or near Eagle river, &c., Michigan | 3,393 83 | 3,393 83 | |
| Light-house at Point Betsey, &c , Michigan | 3,930 17 | 3,930 17 | |
| Light-house at Portage river, Michigan | 4,289 21 | 4,289 21 | |
| Beacon Light at Sand Point, &c., Michigan | 898 40 | | 898 40 |
| Beacon light at Huron, rebuilding, Ohio | 580 00 | 580 00 | |
| Light-house at Black river, &c., Ohio | 18 54 | | 18 54 |
| Channel range light at Maumee bay, Ohio | 2,538 17 | 1,000 00 | 1,538 17 |
| Light-house at or near the north pier head at Chicago, Illinois | 30,452 40 | 30,452 40 | |
| Light-house at Port de Mort, rebuilding, Wisconsin | 4,745 98 | 1,500 00 | 3,245 98 |
| Light on the outer end of the outer pier at Kenosha, Wisconsin | 1,000 00 | | 1,000 00 |
| Lake coast light-house on the west shore of Lake Michigan, &c., Wisconsin | 5,000 00 | 1,000 00 | 4,000 00 |
| Light-house in San Pedro bay, &c., California | 8,600 94 | | 8,600 94 |
| Light-house at Point Boneta, California | 587 17 | | 587 17 |
| Providing a suitable vessel, &c., for visiting lights, &c., on Pacific coast, California | 80,000 00 | 80,000 00 | |
| Light-house, &c , on the main land between Buena Ventura and Point Duma, &c., California | 32,488 27 | 10,000 00 | 22,488,27 |
| Light-house at Cape Mendocino, California | 40,000 00 | 10,000 00 | 30,000 00 |
| Light-house at Santa Cruz, &c., California | 9,063 65 | | 9,063 65 |
| Buoys to mark Commission Ledge, &c., California | 39 40 | | 39 40 |
| Light-house at Humboldt harbor, California | 68 66 | | 68 66 |
| Light-house on or near Point Lobos, &c., California | 17,166 44 | | 17,166 44 |
| Buoys to mark middle ground in Suisun bay, California | 13 80 | | 13 80 |
| Light-house on Punta de los Reyes, California | 17,922 66 | | 17,922 66 |
| Repairs, &c , of lights, &c., on the coasts of California and Oregon | 5,378 06 | 5,378 06 | |
| Expenses of raising, cleaning, &c., beacons, &c., on the coasts of California and Oregon, &c. | 44,000 00 | 14,000 00 | 30,000 00 |
| Commission of 2½ per cent. to superintendents, &c , on the coasts of California and Oregon, &c. | 3,034 38 | | 3,034 38 |
| Salaries of light-house keepers, &c , on the coasts of California and Oregon, &c. | 87,760 15 | 14,000 00 | 73,760 15 |
| Oil and other supplies, &c , on the coasts of California and Oregon, &c | 55,391 80 | 25,000 00 | 30,391 80 |
| Light-house, &c., at Crescent City, &c., California | 19 49 | | 19 49 |
| Beacon at Humboldt harbor, near North Spit, California | 3,480 79 | | 3,480 79 |
| Light-house at Trinity bay, &c , California | 10,269 15 | | 10,269 15 |
| Light-house at Red Bluff, &c., Washington Territory | 23,429 88 | 5,000 00 | 18,429 88 |

No. 3—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government for June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Light house at Minnesota Point, &c., Minnesota | $1,298 20 | $1,298 20 | ---------- |
| Light-house at Beaver bay, &c., Minnesota | 5,217 44 | 1,000 00 | $4,217 44 |
| Light-house at Grand Marais, &c., Minnesota | 6,000 00 | 1,000 00 | 5,000 00 |
| Machinery, &c., for testing Babbage's plan for distinguishing lights, &c. | 4,191 00 | ---------- | 4,191 00 |
| Screw pile light-house near the entrance to the channel of the Mississippi river and St. Louis | 38,700 03 | ---------- | 38,700 03 |
| Marine hospital establishment | 71,667 34 | 71,667 34 | ---------- |
| | 6,348,521 44 | 3,349,621 27 | 2,998,900 17 |

| | | | |
|---|---|---|---|
| surveyor general in Kansas and Nebraska | 1,500 00 | 1,500 00 | |
| clerks in his office | 4,901 09 | 4,901 09 | |
| surveyor general in Utah Territory | 3,000 00 | 3,000 00 | |
| clerks in his office | 6,000 00 | 6,000 00 | |
| Extra clerks and draughtsmen in the offices of the surveyors general, to be apportioned | 54,397 78 | 20,397 78 | 34,000 00 |
| Office rent, &c , in Kansas and Nebraska, surveyor general | 6,900 00 | 3,900 00 | 3,000 00 |
| Office rent, &c., in Utah Territory, surveyor general | 4,147 75 | 2,147 75 | 2,000 00 |
| Expenses of courts of the United States | 735,053 27 | 435,053 27 | 300,000 00 |
| Surveys of the public lands | 168,956 47 | 108,956 47 | 60,000 00 |
| Construction, &c., of suitable cases to receive the collections of the United States exploring expeditions, &c. | 9,000 00 | 9,000 00 | |
| Expense of the transfer of the United States exploring expedition collections, &c. | 2,000 00 | 2,000 00 | |
| Salaries, &c., of the register and receiver of the Chippewa district, Wisconsin | 5,000 00 | 2,500 00 | 2,500 00 |
| Extending the principal, &c., lines in distance of 160 miles | 4,000 00 | | 4,000 00 |
| Surveying standard, &c., lines over coast mountain, &c., in Oregon | 2,814 96 | 2,814 96 | |
| Rent of surveyor general's office, &c., in Oregon | 3,330 29 | 1,330 29 | 2,000 00 |
| Surveying township and subdivision lines, estimated at 4,920 miles, in Oregon, &c. | 32,924 60 | 32,924 60 | |
| Subdividing townships in California, &c | 10 21 | 10 21 | |
| Continuing the survey of the islands off the coast of California, (Coast Survey) | 24,000 00 | 14,000 00 | 10,000 00 |
| Surveying public lands and private land claims in California | 93,897 00 | 93,897 00 | |
| Correcting detached and erroneous surveys in Arkansas | 427 63 | 427 63 | |
| Renewal, &c., of old and erroneous surveys in Arkansas | 156 70 | 156 70 | |
| Resurvey, &c , of old and erroneous surveys in Arkansas | 17,524 67 | 7,524 67 | 10,000 00 |
| Surveying in the southern part of Missouri, &c | 5,591 96 | 5,591 96 | |
| Continuing the surveys of towns and villages in Missouri | 3,200 00 | 2,000 00 | 1,200 00 |
| Furnishing records of private land claims in the office of recorder of land titles at St. Louis | 1,200 00 | 1,200 00 | |
| Defraying expenses of surveying, &c, the boundary between Missouri and Iowa | 5,521 34 | | 5,521 34 |
| Correcting erroneous and defective lines of public and private surveys in Illinois and Missouri, &c | 8,780 36 | 4,780 36 | 4,000 00 |
| Examining, &c , imperfect and defective surveys in the northern part of the lower peninsula, Michigan | 8,957 36 | 2,957 36 | 6,000 00 |
| Resurvey and correction of thirty townships in Michigan | 5 60 | 5 60 | |
| Resurvey and correction of townships 44 to 48, &c., Michigan | 251 40 | 251 40 | |
| Surveying of private claims in Florida, &c | 36,829 08 | 16,829 08 | 20,000 00 |
| Completing certain surveys in Florida, including scrap work | 1,343 48 | 1,343 48 | |
| Continuing survey of the keys off the coast of Florida, (Coast Survey) | 18,500 00 | 8,500 00 | 10,000 00 |
| Surveying in Louisiana at augmented rates, &c | 9,743 76 | 9,743 76 | |
| Resurvey, &c., of the public lands in the States where the offices of the surveyors general have been or shall be closed | 19,650 84 | 9,650 84 | 10,000 00 |
| Surveying the base, principal, &c., lines in Utah Territory | 59,664 15 | 29,664 15 | 30,000 00 |
| Surveying standard, &c., lines in Washington Territory | 11,016 53 | 11,016 53 | |

## No. 4—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the fiscal year ending June 30, 1858. |
|---|---|---|---|
| Stationery, binding books, &c., in the Pension Office | $6,000 00 | $6,000 00 | ---------- |
| Cash system, &c., under laws prior to September 28, 1850, patents and other records for the general and district land offices | 33,500 00 | 20,000 00 | $13,500 00 |
| Contingent expenses in addition, under swamp land act, for the satisfaction of Virginia land warrants | 26,100 00 | 16,100 00 | 10,000 00 |
| Clerk hire, patents, &c., in the General Lan 1 Office, on account of military bounty lands | 25,183 66 | 25,183 66 | ---------- |
| Compensation of surveyor general in Ohio, Indiana, and Michigan | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 3,150 00 | 3,150 00 | ---------- |
| surveyor general in Illinois and Missouri | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 1,910 00 | 1,910 00 | ---------- |
| surveyor general in Louisiana | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 1,250 00 | 1,250 00 | ---------- |
| surveyor general in Florida | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 1,750 00 | 1,750 00 | ---------- |
| surveyor general in Wisconsin and Iowa | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 3,150 00 | 3,150 00 | ---------- |
| surveyor general in Arkansas | 1,000 00 | 1,000 00 | ---------- |
| clerks in his office | 6,441 55 | 6,441 55 | ---------- |
| surveyor general in Oregon | 1,750 00 | 1,750 00 | ---------- |
| clerks in his office | 2,000 00 | 2,000 00 | ---------- |
| surveyor general in California | 3,105 98 | 3,105 98 | ---------- |
| clerks in his office | 9,256 07 | 5,500 07 | 3,756 00 |
| surveyor general of Washington Territory | 1,500 00 | 1,500 00 | ---------- |
| clerks in his office | 2,250 00 | 2,250 00 | ---------- |
| surveyor general in New Mexico | 1,500 00 | 1,500 00 | ---------- |
| clerks in his office | 2,000 00 | 2,000 00 | ---------- |

| | | | |
|---|---|---|---|
| surveyor general in Kansas and Nebraska | 1,500 00 | 1,500 00 | |
| clerks in his office | 4,901 09 | 4,901 09 | |
| surveyor general in Utah Territory | 3,000 00 | 3,000 00 | |
| clerks in his office | 6,000 00 | 6,000 00 | |
| Extra clerks and draughtsmen in the offices of the surveyors general, to be apportioned | 54,397 78 | 20,397 78 | 34,000 00 |
| Office rent, &c , in Kansas and Nebraska, surveyor general | 6,900 00 | 3,900 00 | 3,000 00 |
| Office rent, &c., in Utah Territory, surveyor general | 4,147 75 | 2,147 75 | 2,000 00 |
| Expenses of courts of the United States | 735,053 27 | 435,053 27 | 300,000 00 |
| Surveys of the public lands | 168,956 47 | 108,956 47 | 60,000 00 |
| Construction, &c., of suitable cases to receive the collections of the United States exploring expeditions, &c. | 9,000 00 | 9,000 00 | |
| Expense of the transfer of the United States exploring expedition collections, &c. | 2,000 00 | 2,000 00 | |
| Salaries, &c., of the register and receiver of the Chippewa district, Wisconsin | 5,000 00 | 2,500 00 | 2,500 00 |
| Extending the principal, &c., lines in distance of 160 miles | 4,000 00 | | 4,000 00 |
| Surveying standard, &c., lines over coast mountain, &c., in Oregon | 2,814 96 | 2,814 96 | |
| Rent of surveyor general's office, &c., in Oregon | 3,330 29 | 1,330 29 | 2,000 00 |
| Surveying township and subdivision lines, estimated at 4,920 miles, in Oregon, &c. | 32,924 60 | 32,924 60 | |
| Subdividing townships in California, &c | 10 21 | 10 21 | |
| Continuing the survey of the islands off the coast of California, (Coast Survey) | 24,000 00 | 14,000 00 | 10,000 00 |
| Surveying public lands and private land claims in California | 93,897 00 | 93,897 00 | |
| Correcting detached and erroneous surveys in Arkansas | 427 63 | 427 63 | |
| Renewal, &c., of old and erroneous surveys in Arkansas | 156 70 | 156 70 | |
| Resurvey, &c , of old and erroneous surveys in Arkansas | 17,524 67 | 7,524 67 | 10,000 00 |
| Surveying in the southern part of Missouri, &c | 5,591 96 | 5,591 96 | |
| Continuing the surveys of towns and villages in Missouri | 3,200 00 | 2,000 00 | 1,200 00 |
| Furnishing records of private land claims in the office of recorder of land titles at St. Louis | 1,200 00 | 1,200 00 | |
| Defraying expenses of surveying, &c, the boundary between Missouri and Iowa | 5,521 34 | | 5,521 34 |
| Correcting erroneous and defective lines of public and private surveys in Illinois and Missouri, &c | 8,780 36 | 4,780 36 | 4,000 00 |
| Examining, &c , imperfect and defective surveys in the northern part of the lower peninsula, Michigan | 8,957 36 | 2,957 36 | 6,000 00 |
| Resurvey and correction of thirty townships in Michigan | 5 60 | 5 60 | |
| Resurvey and correction of townships 44 to 48, &c., Michigan | 251 40 | 251 40 | |
| Surveying of private claims in Florida, &c | 36,829 08 | 16,829 08 | 20,000 00 |
| Completing certain surveys in Florida, including scrap work | 1,343 48 | 1,343 48 | |
| Continuing survey of the keys off the coast of Florida, (Coast Survey) | 18,500 00 | 8,500 00 | 10,000 00 |
| Surveying in Louisiana at augmented rates, &c | 9,743 76 | 9,743 76 | |
| Resurvey, &c., of the public lands in the States where the offices of the surveyors general have been or shall be closed | 19,650 84 | 9,650 84 | 10,000 00 |
| Surveying the base, principal, &c., lines in Utah Territory | 59,664 15 | 29,664 15 | 30,000 00 |
| Surveying standard, &c., lines in Washington Territory | 11,016 53 | 11,016 53 | |

## No. 4—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the fiscal year ending June 30, 1859. |
|---|---|---|---|
| Surveying township and subdivision lines, &c , in Washington Territory | $82,162 27 | $42,162 27 | $40,000 00 |
| Rent of surveyor general's office, &c., in Washington Territory | 1,500 00 | 1,500 00 | ---------- |
| Rent of surveyor general's office, &c., in California | 10,925 93 | 5,925 93 | 5,000 00 |
| Continuing surveys in the northern portions of Iowa, Minnesota, and Wisconsin, &c | 4,383 23 | 4,383 23 | ---------- |
| Survey at augmented rates, &c., in Minnesota | 32,321 02 | 32,321 02 | ---------- |
| Purchase of law books, &c., for the office of surveyor general of New Mexico | 500 00 | 500 00 | ---------- |
| Surveying necessary base, meridian, &c., lines in New Mexico | 79,936 98 | 49,936 98 | 30,000 00 |
| Compensation of a translator in the office of surveyor general of New Mexico | 2,000 00 | 2,000 00 | ---------- |
| Surveying necessary base, meridian, &c., lines in Kansas and Nebraska | 55,667 56 | 35,667 56 | 20,000 00 |
| Distribution of the proceeds of the sale of public lands, &c | 55,402 08 | ---------- | 55,402 08 |
| Salaries, &c., of commission to settle land claims in California | 4,836 51 | 4,836 51 | ---------- |
| Expenses of suits against the United States for lands occupied by marine hospitals, &c., California | 6,200 00 | 6,200 00 | ---------- |
| Engraving maps, views, &c., of the boundary between the United States and Mexico | 2,962 49 | 2,962 49 | ---------- |
| Compensation of Commissioner, &c., on boundary between United States and Mexico | 11,583 06 | 11,583 06 | ---------- |
| Repairs of the Potomac navy yard, and upper bridges, &c | 3,000 00 | 3,000 00 | ---------- |
| Enclosing the grounds of the Insane Asylum, D. C | 13,872 00 | 5,872 00 | 8,000 00 |
| Removing the stone wall south of the President's | 15,000 00 | ---------- | 15,000 00 |
| Flagging footway in congressional burying ground, &c | ---------- | ---------- | ---------- |
| Erection of west wing of Patent Office, &c | 1,892 02 | 1,892 02 | ---------- |
| Completing east wing of Patent Office, &c | 416 32 | 416 32 | ---------- |
| Compensation of public gardner, Washington, D. C | 840 00 | 840 00 | ---------- |
| To complete the improvements on the square south of the President's house, &c | 3,000 00 | 3,000 00 | ---------- |
| Fuel for the President's house | 800 00 | 800 00 | ---------- |
| Compensation of assistant doorkeeper President's house | 255 50 | 255 50 | ---------- |
| Compensation of doorkeeper, President's house | 350 00 | 350 00 | ---------- |

| | | | |
|---|---|---|---|
| Continuing grading, &c , unimproved portions of the mall | 4,000 00 | 3,000 00 | 1,000 00 |
| Refurnishing the President's house, &c | 20,000 00 | 20,000 00 | |
| Lighting the Capitol, President's, and the public grounds around them, &c | 25,000 00 | 20,000 00 | 5,000 00 |
| Compensation of the warden, clerk, &c., of the penitentiary, D. C | 6,270 00 | 6,270 00 | |
| Support of the penitentiary, D. C | 6,165 00 | 6,165 00 | |
| Compensation of three inspectors of penitentiary, D. C | 375 00 | 375 00 | |
| Support of 18 transient paupers, D. C | 3,000 00 | 3,000 00 | |
| Filling up, &c., grounds in the vicinity of the national greenhouse | 1,000 00 | 1,000 00 | |
| Purchase of trees and tree boxes, &c., for the public grounds | 4,000 00 | 3,000 00 | 1,000 00 |
| Compensation of two drawkeepers, &c., for bridges across eastern branch of the Potomac | 730 00 | 730 00 | |
| Purchase of 500 burial lots in the congressional burying ground, &c | 5,000 00 | | 5,000 00 |
| Purchase of a site and erecting, &c., an asylum for the insane of District of Columbia, and army and navy | 68,673 00 | 20,673 00 | 48,000 00 |
| Purchase and repair of tools, &c | 500 00 | 500 00 | |
| Support, clothing, &c , of the insane of District of Columbia, &c | 10,500 00 | 10,500 00 | |
| Public reservation No. 2, and Lafayette square | 500 00 | 500 00 | |
| Purchase of manure for the public grounds | 1,000 00 | 1,000 00 | |
| To complete and revise the grades of the city of Washington, &c | 1,750 00 | 1.750 00 | |
| Collection of agricultural statistics, &c , &c | 25,000 00 | 15,000 00 | 10,000 00 |
| Purchase of agricultural and horticultural implements, &c | 2,500 00 | 2,500 00 | |
| Enclosing circle at the intersection of Pennsylvania with New Jersey avenue and K street, &c | 750 00 | 750 00 | |
| Flagging the main avenue in the botanic garden, &c | 3,360 00 | 2,360 00 | 1,000 00 |
| Construction of wooden bridge, &c., across the canal in the line with Maine avenue | 1,500 00 | 1,500 00 | |
| Repair of water pipes at the Capitol | 500 00 | 500 00 | |
| Compensation of laborer in charge of rotunda, &c., Capitol | 255 50 | 255 50 | |
| Lease to the United States from the city of Utica, New York, rooms for use of the courts of the United States | 5,000 00 | | 5,000 00 |
| Rent of suitable rooms at Indianapolis, Indiana, for the preservation of records, &c | 160 00 | 160 00 | |
| Expenses of taking the seventh census of the United States | 877 33 | 877 33 | |
| Arranging, &c., the original returns of the seventh census, &c | 171 13 | | 171 13 |
| Lease of court-rooms and post office at Canandaigua, New York, &c | 12,000 00 | | 12,000 00 |
| Salary of recorder of land titles in Missouri | 375 00 | 250 00 | |
| Compensation of sixteen laborers employed on the public grounds, &c | 7,300 00 | 7,300 00 | |
| Preparing the unfinished records of public and private surveys, &c., &c | 15,279 03 | 15,279 03 | |
| Compensation, &c., of the auxiliary guard | 3,596 63 | 3,596 63 | |
| Expenses of packing and distributing the congressional journals, &c | 19,000 00 | 10,000 00 | 9,000 00 |
| To complete the bridge across the Potomac at the Little Falls, &c | 12,000 00 | 12,000 00 | |
| Compensation of western gate keeper at the Capitol | 516 00 | 516 00 | |

## No. 4—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Compensation of two watchmen to preserve the public grounds about the Capitol | $700 00 | $700 00 | ---------- |
| Compensation of two night-watchmen at President's house | 700 00 | 700 00 | ---------- |
| Furnace at President's house | 212 00 | 212 00 | ---------- |
| Erection of stables, &c., at President's house | 6,000 00 | 6,000 00 | ---------- |
| Flooring basement rooms in the old portion of the Patent Office building, &c | 6,000 00 | 3,000 00 | $3,000 00 |
| Preparing the saloon of the west wing of the Patent Office for the reception of models for patents, &c | 40,000 00 | 30,000 00 | 10,000 00 |
| Erection of north front of the Patent Office | 255,000 00 | 80,000 00 | 200,000 00 |
| Casual repairs of the Patent Office | 2,500 00 | 2,500 00 | ---------- |
| Patent fund | 21,552 00 | 21,552 00 | ---------- |
| Preservation of the collections of the Exploring Expedition, compensation of keepers, &c | 2,142 73 | 2,142 73 | ---------- |
| Contingent expenses for the collections of Exploring Expedition, &c | 100 00 | 100 00 | ---------- |
| Expense of running and marking boundary between United States and Mexico, (arrearages) | 23,314 61 | 8,000 00 | 15,314 61 |
| Running and marking boundary line between United States and Mexico, under treaty of December, 30, 1853, &c | 51,696 72 | 18,000 00 | 33,696 72 |
| Expenses of running boundary between the State of Texas and New Mexico | 10,000 00 | 10,000 00 | ---------- |
| Salaries and commissions of registers and receivers of land offices, &c | 195,287 34 | 40,000 00 | 155,287 34 |
| Expenses of depositing public moneys by receivers, &c | 83,648 22 | 20,000 00 | 63,648 22 |
| Incidental expenses of the several land offices | 51,125 18 | 20,000 00 | 31,125 18 |
| Payment of war bounty land certificates, &c | 17,189 78 | ---------- | 17,189 78 |
| Purchase of books for the territorial libraries of Minnesota, &c., &c | 500 00 | 500 00 | ---------- |
| Compensation of one night watchman for buildings south of the Capitol | 350 00 | 350 00 | ---------- |
| Survey of Indian lands in Kansas under treaty with Delawares | 314 96 | 314 96 | ---------- |
| Survey of Indian lands in Kansas under treaty with Kaskaskias, Peorias, &c | 32 87 | 32 87 | ---------- |
| Survey of Indian lands in Kansas under treaty with Shawnees | 4,849 89 | 4,849 89 | ---------- |

| | | | |
|---|---|---|---|
| Execution of surveys required by treaties with various Indian tribes, &c | 2,761 53 | 2,761 53 | ..... |
| Survey of Indian lands in Kansas under treaty with Iowas | 262 65 | 262 65 | ..... |
| Survey of Indian lands in Kansas under treaty with Miamies | 2,541 08 | 2,541 08 | ..... |
| Survey of Indian lands in Kansas under treaty with Wyandotts | 722 11 | 722 11 | ..... |
| | 3,198,069 11 | 1,849,043 16 | 1,349,025 95 |

## No. 5.

### *Pensions and Indian Affairs.*

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Half-pay pensions to widows and orphans, payable through the Third Auditor's office | $36,249 69 | $5,000 00 | $31,249 69 |
| Pensions, per acts March 18, 1818; May 15, 1828; June 7, 1832 | 23,824 19 | 23,824 19 | ---------- |
| per acts July 4, 1836; July 7, 1838; March 3, 1843; June 17, 1844; February 2 and July 29, 1848; February 3, 1853, section 2 | 428,727 90 | 428,727 90 | ---------- |
| per acts July 21, 1848; February 3, 1853, section 1; and under special acts of Congress | 79,563 49 | 79,563 49 | ---------- |
| invalid, army | 344,126 84 | 344,126 84 | ---------- |
| navy, (five years,) to widows and orphans, act August 11, 1848 | 64,437 87 | 64,437 87 | ---------- |
| navy, privateer | 1,513 47 | 1,513 47 | ---------- |
| invalid, navy | 52,191 17 | 52,191 17 | ---------- |
| Navy pension fund | 20,422 16 | 20,422 16 | ---------- |
| Fulfilling treaties with Blackfoot nation, of October 17, 1855 | 43,377 80 | 29,699 63 | 13,678 17 |
| Camanches, Kiowas, and Apaches of Arkansas river | 2,321 55 | 2,321 55 | ---------- |
| Chippewas of Lake Superior, of September 30, 1854 | 60,157 60 | 60,157 60 | ---------- |
| Chippewas of Lake Superior and the Mississippi | 41,133 49 | 41,133 49 | ---------- |
| Chippewas of Saginaw | 5,440 08 | 300 00 | 5,140 08 |
| Chippewas of Saginaw, (proceeds of land) | 3,461 80 | 3,461 80 | ---------- |
| Chippewas of Saginaw, Swan creek, and Black river | 8,539 74 | 8,539 74 | ---------- |
| Chippewas of the Mississippi, February 22, 1855 | 30,770 01 | 24,010 01 | 6,760 00 |
| Chippewas, Menomonees, Winnebagoes, and New York Indians | 3,096 18 | 750 00 | 2,346 18 |
| Chippewas, Ottawas, and Pottowatomies | 800 00 | 800 00 | ---------- |
| Cherokees, (proceeds of land) | 40 45 | 40 45 | ---------- |
| Creeks | 236,106 90 | 208,300 00 | 27,806 90 |
| Chickasaws | 3,000 00 | 3,000 00 | ---------- |

| | | | |
|---|---|---|---|
| Christian Indians | 800 00 | ---------- | 800 00 |
| Choctaws | 34,620 00 | 4,770 00 | 29,850 00 |
| Chastas, Scoton, and Umpquas | 5,000 00 | ---------- | 5,000 00 |
| Delawares | 5,203 10 | 3,328 10 | 1,875 00 |
| Delawares, (proceeds of land) | 69,248 40 | 69,248 40 | ---------- |
| Florida Indians, or Seminoles | 218,436 81 | 218,436 81 | ---------- |
| Iowas | 6,583 84 | 6,583 84 | ---------- |
| Iowas, (proceeds of land) | 35,747 76 | 35,747 76 | ---------- |
| Kansas | 25,221 64 | 9,460 00 | 15,761 64 |
| Kickapoos | 11,845 27 | 6,557 45 | 5,287 82 |
| Kaskaskias, Peorias, Weas, and Piankeshaws | 11,244 88 | 11,244 88 | ---------- |
| Kaskaskias, Peorias, Weas, and Piankeshaws, (proceeds of land) | 49,232 33 | 49,232 33 | ---------- |
| Miamies | 59,288 74 | 41,164 53 | 18,124 21 |
| Miamies of Eel river | 1,100 00 | 1,100 00 | ---------- |
| Menomonees | 68,093 08 | 58,093 08 | 10,000 00 |
| Navajoes | 16,397 50 | 5,000 00 | 11,397 50 |
| Ottawas and Chippewas | 21,531 96 | 21,531 96 | ---------- |
| Ottawas and Chippewas of Michigan | 5,955 24 | 5,955 24 | ---------- |
| Osages | 52,790 12 | 27,423 42 | 25,366 70 |
| Omahas | 29,825 59 | 10,443 59 | 19,382 00 |
| Ottawas | 1,734 00 | ---------- | 1,734 00 |
| Ottawas of Kansas | 2,600 00 | ---------- | 2,600 00 |
| Ottoes and Missourias | 20,090 35 | 9,871 60 | 10,218 75 |
| Pottowatomies | 97,944 07 | 33,792 34 | 64,151 73 |
| Pottowatomies of the Huron | 400 00 | ---------- | 400 00 |
| Pawnees | 9,618 69 | 902 21 | 8,716 48 |
| Quapaws | 3,508 36 | 3,508 36 | ---------- |
| Rogue River Indians | 14,548 25 | 14,548 25 | ---------- |
| Sioux of Mississippi | 301,951 68 | 101,951 68 | 200,000 00 |
| Sacs and Foxes of Mississippi | 133,570 02 | 37,181 06 | 96,388 96 |
| Sacs and Foxes of Missouri | 17,960 00 | 750 00 | 17,210 00 |
| Senecas | 2,201 59 | 2,201 59 | ---------- |
| Senecas of New York | 8,046 90 | 8,046 90 | ---------- |
| Senecas and Shawnees | 2,290 00 | 2,290 00 | ---------- |
| Shawnees | 7,206 23 | 7,206 23 | ---------- |
| Six Nations of New York | 5,180 90 | 5,180 90 | ---------- |
| Stockbridges | 1,944 00 | 1,944 00 | ---------- |
| Stockbridges and Munsees | 49,789 26 | 45,144 95 | 4,644 31 |
| Utahs | 23,001 24 | 5,000 00 | 18,001 24 |

## No. 5—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Fulfilling treaties with Umpquas, Cow Creek band | $50 00 | $50 00 | |
| Winnebagoes | 137,472 97 | 94,718 07 | $42,754 90 |
| Wyandotts | 4,578 85 | 4,578 85 | |
| Interest on stocks due Chippewas of Swan creek | 1,843 76 | 1,843 76 | |
| Chippewas and Ottawas | 6,082 18 | 6,082 18 | |
| Chippewas, Ottawas, and Pottowatomies—education | 3,952 29 | 3,952 29 | |
| Chippewas, Ottawas, and Pottowatomies—mills | 24,138 85 | 24,138 85 | |
| Choctaws—education | 7,598 88 | 7,598 88 | |
| Choctaws—orphan reservations | 16,950 41 | 16,950 41 | |
| Choctaws—under convention with Chickasaws | 224 08 | 224 08 | |
| Choctaw claimants | 17,410 67 | 17,410 67 | |
| Cherokee treaty of 1835-'36 | 10,834 91 | 10,834 91 | |
| Creek orphans | 9,793 45 | 9,793 45 | |
| Delawares | 24,273 70 | 24,273 70 | |
| Iowas | 2,450 72 | 2,450 72 | |
| Indian tribes, and reimbursable | 119 53 | 119 53 | |
| Kaskaskias, Peorias, Weas, and Piankeshaws | 5,110 30 | 5,110 30 | |
| Menomonees | 9,366 33 | 9,366 33 | |
| Osages—education | 13,492 86 | 13,492 86 | |
| Ottawas of Blanchard's fork | 1,016 80 | 1,016 80 | |
| Ottawas of Roche de Boeuf | 188 52 | 188 52 | |
| Senecas | 250 00 | 250 00 | |
| Senecas of New York | 46 96 | 46 96 | |
| Senecas and Shawnees | 892 96 | 892 96 | |
| Shawnees | 1,459 07 | 1,459 07 | |

| | | | |
|---|---|---|---|
| Stockbridges and Munsees | 156 12 | 156 12 | ..... |
| Wyandotts | 2,672 84 | 2,672 84 | ..... |
| Carrying into effect treaty with the Chickasaws of October, 1832 | 102,912 05 | 102,912 05 | ..... |
| Chickasaw orphans, under treaty of July 1, 1834 | 2,557 70 | 2,557 70 | ..... |
| Cherokee schools, (1819) | 1,624 37 | 1,624 37 | ..... |
| Incompetent Indians | 3,703 56 | 3,703 56 | ..... |
| Kansas schools | 17,849 99 | 17,849 99 | ..... |
| Pay of superintendents and Indian agents | 24,858 71 | 24,858 71 | ..... |
| Pay of Indian sub-agents | 6,915 99 | 6,915 99 | ..... |
| Pay of interpreters | 27,134 06 | 11,563 08 | 15,570 98 |
| Civilization of Indians | 23,659 44 | 3,659 44 | 20,000 00 |
| Presents to Indians | 4,448 03 | 4,448 03 | ..... |
| Provisions for Indians | 13,529 19 | 3,529 19 | 10,000 00 |
| Buildings and repairs at the agencies | 9,098 68 | 5,000 00 | 4,098 68 |
| Vaccination of Indians | 2,196 00 | 1,000 00 | 1,196 00 |
| Medals for Indian chiefs | 2,200 00 | 1,100 00 | 1,100 00 |
| Contingencies of the Indian department | 6,355 19 | 6,355 19 | ..... |
| Pay of clerk to superintendent at St. Louis | 655 91 | 655 91 | ..... |
| Pay of clerk to superintendent in California | 1,664 40 | 1,250 00 | 414 40 |
| Temporary clerks to superintendents of Indian affairs | 6,134 01 | 3,000 00 | 3,134 01 |
| Incidental expenses of Indian service in California | 12,971 49 | 12,971 49 | ..... |
| Territory of Utah | 4,251 64 | 4,251 64 | ..... |
| Territory of Washington | 2,499 67 | 2,499 67 | ..... |
| Territory of New Mexico | 46,594 22 | 46,594 22 | ..... |
| Negotiating treaties with Indians in the Territory of Utah | 9,628 45 | 9,628 45 | ..... |
| Indians in the Territory of Oregon | 7,127 98 | 7,127 98 | ..... |
| Indians in the Territory of Washington | 2,732 87 | 2,732 87 | ..... |
| Rogue River and Cow Creek band of Umpqua Indians | 2,000 00 | 2,000 00 | ..... |
| Apache, Navajo, and Utah Indians in New Mexico | 21,299 16 | 21,299 16 | ..... |
| Chippewas of Lake Superior of September 30, 1854 | 70 | 70 | ..... |
| Chippewas ratified in 1848 | 208 65 | 208 65 | ..... |
| Chippewas in Minnesota and Wisconsin for extinguishment of title to lands | 1,974 30 | 1,974 30 | ..... |
| Holding treaties with various Indian tribes in California | 536 47 | 536 47 | ..... |
| Holding council with Blackfeet, Gros Ventres, and other wild tribes of Indians in Washington Territory | 8,420 11 | 8,420 11 | ..... |
| Payment of liabilities of Indian service in Oregon Territory | 97 32 | 97 32 | ..... |
| Insurance and transportation of annuities to Indian tribes in Oregon Territory | 1,400 00 | 1,400 00 | ..... |
| Insurance and transportation of annuities, goods, &c., to Indian tribes in Minnesota, Michigan, and Wisconsin | 6,262 65 | 6,262 65 | ..... |
| Compensation of three special agents and three interpreters for Indians of Texas | 7,010 46 | 7,010 46 | ..... |

## No. 5—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Colonizing, supporting, &c., Indians in Texas | $94,742 27 | $94,742 27 | ---------- |
| Removal and subsistence of Indians in California | 28,148 71 | 28,148 71 | ---------- |
| Removal and subsistence of Indians in California, and for pay of physicians, smiths, mechanics, &c | 81,000 00 | 81,000 00 | ---------- |
| Removal and subsistence of Indians in the Territory of Washington | 4,917 00 | 4,917 00 | ---------- |
| Removal and subsistence of Catawbas to the west of the Mississippi | 5,000 00 | 5,000 00 | ---------- |
| Removal and subsistence of Indians | 3,670 75 | 3,670 75 | ---------- |
| Removal of such Seminoles as may surrender for emigration | 2,000 00 | 2,000 00 | ---------- |
| Removal of Choctaws from Mississippi | 325 82 | 325 82 | ---------- |
| Collecting statistics of Indian tribes | 10,400 16 | 10,400 16 | ---------- |
| Collecting and establishing the southern Camanches, Wichitaws, &c., on reservations south of the Arkansas river | 49,000 00 | 49,000 00 | ---------- |
| Payment of annuities and transportation to certain Indian tribes, per treaty of Fort Laramie | 94,802 90 | 94,802 90 | ---------- |
| Payment to North Carolina Cherokees (principal) for their removal and subsistence | 42,290 69 | 42,290 69 | ---------- |
| Payment of such Cherokees as were omitted in the census taken by D. W. Siler | 2,188 56 | 2,188 56 | ---------- |
| Payment for goods borrowed by J. S. Watrous and destroyed by fire | 4,136 03 | 4,136 03 | ---------- |
| Payment to Cherokee nation of $724,603 37, and interest, at 5 per cent, &c | 219 62 | 219 62 | ---------- |
| Payment of awards to W. B. Mitchell | 1,674 14 | 1,674 14 | ---------- |
| Payment of awards under articles 12, 13, and 16 of Cherokee treaty of December 29, 1835, &c | 1 | 1 | ---------- |
| Payment of the value of property of Baker & Street, destroyed by the Kiowa Indians | 50 00 | 50 00 | ---------- |
| Payment of Spunk, or Bald Frog, *alias* Joseph Henson | 400 00 | 400 00 | ---------- |
| Presents to bands of Pueblo Indians in New Mexico | 3,641 89 | 3,641 89 | ---------- |
| Presents to Camanches, Kiowas, and other Indians on the Arkansas river | 280 94 | 280 94 | ---------- |
| Extinguishing title of Indian tribes to lands west of Missouri and Iowa | 3,820 55 | 3,820 55 | ---------- |
| Running and marking northern and western boundary of Creek country, west of the Arkansas | 76 40 | 76 40 | ---------- |
| Running and marking eastern boundary of Creek country, west of the Arkansas | 283 96 | 283 96 | ---------- |

| | | | |
|---|---|---|---|
| Survey of Creek boundary | 20,900 00 | 20,900 00 | |
| Surveying and allotting to the proper persons the reserved tracts, &c | 4,812 31 | 4,812 31 | |
| Surveying and marking boundary of Choctaw and Chickasaw country, &c | 10,699 00 | 10,699 00 | |
| Surveying boundaries of Indian reservations, and allotting and defining Indian reserves and half-breed lands | 11,250 00 | 11,250 00 | |
| Surveying and marking eastern boundaries of Indian pueblos in New Mexico | 3,750 00 | 3,750 00 | |
| Resurveying and marking eastern boundary set apart for Choctaw nation | 3,462 00 | 3,462 00 | |
| Pay of six agents, per section 6, act of July 31, 1854 | 4,500 00 | 4,500 00 | |
| Rescuing prisoners from Indian tribes | 2,753 31 | 2,753 31 | |
| Opening communication with Camanches, Apaches, &c | 10,000 00 | 10,000 00 | |
| Drafts, checks, and deposits with Selden, Withers & Co., to be reimbursed to the government when collected | 2,456 67 | 2,456 67 | |
| Preventing trespasses and depredations by Indians | 5,000 00 | 5.000 00 | |
| Balance due Creek Indians for losses during last war with Great Britain | 684 00 | 684 00 | |
| Revising, preparing, and printing a new Code of Regulations for the Indian Department | 2,000 00 | 2,000 00 | |
| Additional amount paid for subsistence improperly charged to treaty fund | 161 93 | 161 93 | |
| Arrearages of compensation from Oct. 1, 1850, to June 30, 1851, for 3 Indian agents for tribes in Cal. | 2,250 00 | 2,250 00 | |
| Compensation and expense of committee of "old settler party" | 265 00 | 265 00 | |
| Stocks redeemed and due Cherokees—treaty of 1835 and 1836 | 380 03 | 380 03 | |
| Stocks redeemed and due Cherokee school fund, 1819 | 123 86 | 123 86 | |
| Purchase of stock for Great and Little Osages | 15,000 00 | 15,000 00 | |
| Carrying into effect Choctaw treaty on account of lands relinquished | 826 26 | 826 26 | |
| Carrying into effect Choctaw treaty, act of June 11, 1842 | 95 83 | 95 83 | |
| Carrying into effect treaty with Stockbridges and Munsees | 63 00 | 63 00 | |
| Carrying into effect treaty with Chippewas of October, 1842 | 452 47 | 452 47 | |
| Carrying out treaties with Ottoes, Missourias, Delawares, Omahas, Iowas, &c | 2,155 02 | 2,155 02 | |
| Restoring and maintaining peace with Indian tribes in Oregon Territory | 15,894 78 | 15,894 78 | |
| Road from Fort Kearney to California | 126,209 90 | 26,209 90 | $100,000 00 |
| Road from El Paso to Fort Yuma | 101,383 75 | 51,383 75 | 50,000 00 |
| Road from Platte river to Running Water river | 5,000 00 | 5,000 00 | |
| Road from Fort Ridgely to South Pass of the Rocky mountains | 7,500 80 | 7,500 80 | |
| Payment to Pottowatomies for corn crop abandoned | 17 50 | 17 50 | |
| Removal and subsistence of Pottowatomies of Indiana | 75 | 75 | |
| Preservation of peace with Indians of California | 48 30 | 48 30 | |
| Expense of California superintendency | 2 95 | 2 95 | |
| Transportation of annuities, goods, &c., to the Sioux of Mississippi | 984 26 | 984 26 | |
| Relief of Omaha Indians | 2,500 00 | 2,500 00 | |
| | 4,412,649 69 | 3,510,489 36 | 902,160 33 |

## No. 6.

### UNDER THE CONTROL OF THE WAR DEPARTMENT.

*Statement of balances of appropriations January* 22, 1858, *the amounts (estimated) that may be required for the service of the government to June* 30, 1858, *and the amounts (estimated) applicable to the service of the fiscal year ending June* 30, 1859.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Pay of the army | $2,342,341 25 | $2,000,000 00 | $342,341 25 |
| Subsistence of the army | 962,457 79 | 962,457 79 | ..... |
| Subsistence of officers | 372,599 60 | 372,599 60 | ..... |
| Transportation of the army | 4,731 11 | 4,731 11 | ..... |
| Forage | 122,467 71 | 100,000 00 | 22,467 71 |
| Clothing of the army | 173,470 60 | 173,470 60 | ..... |
| Payment, in lieu of clothing, for officers' servants | 19,169 23 | 19,169 23 | ..... |
| Purchase of horses for dragoons | 19,292 07 | 19,292 07 | ..... |
| Expenses of recruiting | 62,444 82 | 62,444 82 | ..... |
| Raising four additional regiments | 111,559 67 | 111,559 67 | ..... |
| Quartermaster's department | 35,421 18 | 35,421 18 | ..... |
| Transportation and supplies in the quartermaster's department | 11,754 14 | 11,754 14 | ..... |
| Incidental expenses of the quartermaster's department | 22,463 85 | 22,463 85 | ..... |
| Transportation of officers' baggage | 12,569 02 | 12,569 02 | ..... |
| Medical and hospital department | 124,677 70 | 124,677 70 | ..... |
| Barracks, quarters, &c | 13,124 96 | 13,124 96 | ..... |
| Contingencies of the army | 13,189 56 | 13,189 56 | ..... |
| Threee months' extra pay | 36,440 52 | 20,000 00 | 16,440 52 |

| | | | |
|---|---|---|---|
| ...ment to discharged soldiers for clothing not drawn | 49,314 14 | 49,314 14 | |
| Subsistence of ten regiments regular troops | 7,925 05 | 7,925 05 | |
| Remounting the four companies of light artillery | 5,269 18 | 5,269 18 | |
| Surveys with armies in the field | 33 30 | 33 30 | |
| Purchase of stoves for officers' and soldiers' quarters | 20,000 00 | 20,000 00 | |
| Pay of officers, cadets, &c., at West Point | 42,254 71 | 42,254 71 | |
| Subsistence of officers, &c., at West Point | 53 26 | 53 26 | |
| Forage for officers' horses at West Point | 3,950 66 | 2,000 00 | 1,950 66 |
| Current and ordinary expenses at West Point | 6,000 00 | 6,000 00 | |
| Forage for artillery and cavalry horses at West Point | 1,640 00 | 1,640 00 | |
| Supplying horses for artillery and cavalry practice at West Point | 1,000 00 | 1,000 00 | |
| Increase and expense of library at West Point | 500 00 | 500 00 | |
| Expense of Board of Visitors at West Point | 3,000 00 | 3,000 00 | |
| Balistic apparatus for gun pendulum at West Point | 500 00 | 500 00 | |
| Extension of water-pipes, and increase of reservoir at West Point | 2,000 00 | 2,000 00 | |
| Arming and equipping the militia | 93,571 98 | 93,571 98 | |
| Armament of fortifications | 171,176 14 | 171,176 14 | |
| Arsenals | 215,377 13 | 215,377 13 | |
| Manufacture of arms at the national armories | 6,655 18 | 6,655 18 | |
| Repairs, &c., at Springfield armory | 710 67 | 710 67 | |
| Repairs, &c., at Harper's Ferry armory | 17,059 97 | 17,059 97 | |
| Purchase of lots, &c., at Harper's Ferry | 4,629 58 | 4,629 58 | |
| Armory for the militia of the District of Columbia | 4,827 00 | 4,827 00 | |
| Purchase of ground adjacent to Washington arsenal | 23,083 53 | 23,083 53 | |
| Machinery, tools, &c., for an arsenal of construction at Fayetteville, N. C | 30,350 00 | 30,350 00 | |
| Purchase of best breech-loading rifles | 33,826 50 | 33,826 50 | |
| Ordnance service | 85,731 09 | 85,731 09 | |
| Ordnance, ordnance stores, and supplies | 70,645 94 | 70,645 94 | |
| Fort Adams | 5,509 00 | 5,509 00 | |
| Barrancas | 16,333 24 | 16,333 24 | |
| Carroll | 136,939 78 | 136,939 78 | |
| Calhoun | 130,048 00 | 130,048 00 | |
| Clinch | 28,000 00 | 28,000 00 | |
| Columbus and Castle William | 1,976 09 | 1,976 09 | |
| Delaware | 55,000 00 | 55,000 00 | |
| Fort Point | 248,770 66 | 248,770 66 | |
| Gaines | 50,600 00 | 50,600 00 | |
| Hamilton and wharf | 4,311 26 | 4,311 26 | |
| Independence | 9,923 27 | 9,923 27 | |

No. 6—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Fort Johnson | $1,132 30 | $1,132 30 | ..... |
| Jackson, Savannah river, Ga | 19,000 00 | 19,000 00 | ..... |
| Jackson, Mississippi river, La | 11,150 00 | 11,150 00 | ..... |
| Jefferson | 64,000 02 | 64,000 02 | ..... |
| Knox | 20,000 60 | 20,000 60 | ..... |
| Lafayette | 10,000 00 | 10,000 00 | ..... |
| Montgomery | 10,000 00 | 10,000 00 | ..... |
| Monroe | 23,000 00 | 23,000 00 | ..... |
| Moultrie | 5,000 00 | 5,000 00 | ..... |
| Macon | 547 40 | 547 40 | ..... |
| Morgan | 2,613 61 | 2,613 61 | ..... |
| Macomb | 1,483 11 | 1,483 11 | ..... |
| Madison | 10,000 00 | 10,000 00 | ..... |
| Pulaski | 26,300 00 | 26,300 00 | ..... |
| Pike | 6 25 | 6 25 | ..... |
| Pickens | 8,000 00 | 8,000 00 | ..... |
| Richmond | 85,998 92 | 85,998 92 | ..... |
| Schuyler | 12,499 56 | 12,499 56 | ..... |
| Scammel | 2,019 02 | 2,019 02 | ..... |
| Sumpter | 75,000 00 | 75,000 00 | ..... |
| St. Philip | 26,369 24 | 26,369 24 | ..... |
| Taylor | 39,413 98 | 39,413 98 | ..... |
| Warren | 7,174 22 | 7,174 22 | ..... |
| Winthrop | 18,000 00 | 18,000 00 | ..... |
| Wood | 3,000 00 | 3,000 00 | ..... |

| | | | |
|---|---|---|---|
| *opposite Fort Schuyler* | 27,025 00 | 27,025 00 | ..... |
| *on site of Fort Tompkins* | 149,500 00 | 99,500 00 | $50,000 00 |
| Forts on the western frontier of Texas | 150,000 00 | ..... | 150,000 00 |
| Fortifications at Alcatraz island | 163,749 28 | 163,749 28 | ..... |
| at entrance of Kennebec river | 99,500 00 | 49,500 00 | 50,000 00 |
| on Hog Island Ledge | 49,500 00 | 49,500 00 | ..... |
| at entrance of New Bedford harbor | 68,500 00 | 68,500 00 | ..... |
| at Sandy Hook | 190,000 00 | 90,000 00 | 100,000 00 |
| for defence of inner passes into Mobile bay | 99,850 00 | 49,850 00 | 50,000 00 |
| for defence of entrance to Galveston bay and harbor | 80,000 00 | 60,000 00 | 20,000 00 |
| in Charleston harbor | 414 21 | 414 21 | ..... |
| of Ship island, coast of the Mississippi | 95,000 00 | 45,000 00 | 50,000 00 |
| Barracks at Fort Towson | 997 67 | 997 67 | ..... |
| for the western frontier | 2,981 52 | 2,981 52 | ..... |
| on the Republican fork of the Kansas | 3,813 81 | 3,813 81 | ..... |
| Repairs, &c., of barracks, quarters, &c., at forts not occupied by troops | 15,500 00 | 15,500 00 | ..... |
| Military defences at Proctor's Landing | 15,867 51 | 15,867 51 | ..... |
| Military post in the Territory of Minnesota | 20,000 00 | 20,000 00 | ..... |
| Contingencies of fortifications | 62,572 18 | 62,572 18 | ..... |
| Purchase of a site and additional defences for San Francisco | 300,000 00 | 300,000 00 | ..... |
| Platforms for modern cannon in fortifications of harbors | 94,000 00 | 94,000 00 | ..... |
| Tower Dupré | 11,841 00 | 11,841 00 | ..... |
| Repairs of Battery Bienvenue | 1 16 | 1 16 | ..... |
| Defensive works and barracks near Buffalo, New York | 9 00 | 9 00 | ..... |
| Road from Wabashaw to Mendota | 20 00 | 20 00 | ..... |
| Point Douglas to Falls of St. Louis | 10,030 00 | 10,030 00 | ..... |
| Point Douglas to Fort Ripley | 1,550 01 | 1,550 01 | ..... |
| Swan river to Winnebago agency | 42 80 | 42 80 | ..... |
| Mendota to Big Sioux river | 63 68 | 63 68 | ..... |
| Steilacoom to Fort Wallah-Wallah | 743 39 | 743 39 | ..... |
| Point on Missouri river, opposite city of Council Bluffs, to New Fort Kearney | 1,334 00 | 1,334 00 | ..... |
| Great Falls of Missouri river to the road from Wallah-Wallah to Puget's Sound | 30,000 00 | ..... | 30,000 00 |
| Fort Ripley, via Crow Wing, to the Red river | 6,710 00 | 6,710 00 | ..... |
| Myrtle creek to Camp Stuart | 245 17 | 245 17 | ..... |
| Myrtle creek to Scottsburg | 24 00 | 24 00 | ..... |
| Survey for military defences of the sea and inland frontier | 2 60 | 2 60 | ..... |
| Military and geographical surveys west of the Mississippi | 1,375 43 | 1,375 43 | ..... |
| Ponton bridge train | 14,416 00 | 14,416 00 | ..... |
| Bridges between Fort Leavenworth and Republican fork of Kansas river | 1,893 42 | 1,893 42 | ..... |

No. 6—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Repairs of bridge over Mill creek, Old Point Comfort | $800 00 | $800 00 | ..... |
| Surveying and opening military road on the western frontier | 4,446 08 | 4,446 08 | ..... |
| Reopening communication between Albemarle sound and Atlantic ocean | 8,389 72 | 8,389 72 | ..... |
| Removing obstructions in the Savannah river | 67,798 91 | 67,798 91 | ..... |
| Removing obstructions in the mouth of the Mississippi river | 324,000 00 | 4,000 00 | $320,000 00 |
| Deepening channel of St. Mary's river, Michigan | 50,000 00 | 50,000 00 | ..... |
| Improvement of Patapsco river | 17,000 00 | 17,000 00 | ..... |
| Des Moines rapids, in the Mississippi river | 170,000 00 | 70,000 00 | 100 000 00 |
| Cape Fear river | 5,000 00 | 5,000 00 | ..... |
| harbor of Sheboygan | 940 00 | 940 00 | ..... |
| Arkansas river | 23 60 | 23 60 | ..... |
| mouth of Genesee river | 176 10 | 176 10 | ..... |
| harbor of Bridgeport | 99 60 | 99 60 | ..... |
| river St. John's, Florida | 4 57 | 4 57 | ..... |
| Removing rocks, &c , near Falls island, Cobscook bay, Maine | 1,126 49 | ..... | 1,126 49 |
| Removing rocks, &c., near the mouth of Seekonk river, Rhode Island | 58 01 | ..... | 58 01 |
| Survey of northern and northwestern lakes | 46,948 36 | 46,948 36 | ..... |
| in reference to the construction of a breakwater, &c., island of Martinicus, Maine | 837 70 | ..... | 837 70 |
| of harbors of Sabine, Galveston, &c., Texas | 86 02 | 86 02 | ..... |
| of East Pascagoula river | 11 00 | ..... | 11 00 |
| of Savannah river up to Augusta | 15 62 | 15 62 | ..... |
| of Shrewsbury river | 5 84 | ..... | 5 84 |
| of harbor of Scituate | 87 96 | ..... | 87 96 |
| Repairs and contingencies of harbors | 1,247 28 | 1,247 28 | ..... |
| Materials, tools, &c., in building the four steam dredges for Lakes Champlain, Erie, &c | 585 49 | ..... | 585 49 |

| | | | |
|---|---|---|---|
| Repairing the piers at Kennebunk, Maine | 83 49 | | 83 49 |
| Pier and mole at Oswego | 160 00 | 160 00 | |
| Foundation for light house on the breakwater at the harbor of Waukegan, Illinois | 10,500 00 | | 10,500 00 |
| Printing charts of lake surveys | 7,000 00 | 7,000 00 | |
| Breakwater at Richmond Island harbor | 155 78 | | 155 78 |
| Repairing sea wall at St. Augustine | 6 17 | 6 17 | |
| Repairs of public works at harbor of Chester | 107 75 | 107 75 | |
| Government works, Plymouth beach | 1 66 | 1 66 | |
| Connecting the waters of Indian river and Mosquito lagoon | 5 06 | | 5 06 |
| Repairing the public works at Little Egg Harbor | 942 76 | | 942 76 |
| Improvement of the Ohio river, including dam | 10 05 | 10 25 | |
| Snag-boats, dredge-boats, &c., for Ohio, Mississippi, Missouri, Arkansas, and other western rivers | 62 84 | 62 84 | |
| Survey of Trinity river, Texas | 1,617 11 | | 1,617 11 |
| Improvement of the navigation of the Colorado river | 182 86 | | 182 86 |
| Survey of the San Antonio river | 44 58 | | 44 58 |
| Repairing breakwater at Hyannis harbor | 47 24 | | 47 24 |
| Survey in reference to a breakwater at East Dennis | 1,492 43 | | 1,492 43 |
| Survey of Taunton river and New Bedford harbor | 49 79 | | 49 79 |
| Preservation of Great Woods Hole harbor | 17 24 | | 17 24 |
| Dome of the Capitol of the United States | 485,000 00 | 485,000 00 | |
| Extension of the Capitol | 245,000 00 | 245,000 00 | |
| Extension of the General Post Office | 145,000 00 | 145,000 00 | |
| Washington aqueduct | 695,000 00 | 695,000 00 | |
| Pay of volunteers, per act March 2, 1847 | 18,910 95 | 6,000 00 | 12,910 95 |
| Pay of volunteers, under resolution of August 8, 1846 | 7,022 95 | | 7,022 95 |
| Pay of 4 companies volunteers, called out by Lieut. Col. Washington | 41,601 05 | 41,601 05 | |
| Pay of 5 companies Texas mounted volunteers | 459 26 | 459 26 | |
| Pay of 6 companies Texas volunteers, called out by Brig. Gen Smith | 69,574 90 | 36,574 90 | 33,000 00 |
| Pay of 6 companies New Mexico volunteers, under Gen. Garland | 9,677 87 | 9,677 87 | |
| Pay of Florida militia, on account of the quartermaster's department | 4,537 08 | 4,537 08 | |
| Pay of Florida militia, on account of subsistence | 1,012 97 | 1,012 97 | |
| Pay and supplies of mounted and foot companies of Florida volunteers | 36,509 53 | 36,509 53 | |
| Pay of the companies of Captains Bush, Price, and Suarez, for military services in Florida | 271 85 | | 271 85 |
| Payment of Texas volunteers, under General Brooke | 17 60 | 17 60 | |
| mounted riflemen, volunteers, under Captain John C. Frémont, in 1846–'47 | 111,488 08 | 11,488 08 | 100,000 00 |
| claims adjudicated by a board of army officers to mounted riflemen, under Captain J. C. Frémont, in 1846 | 6,905 67 | 6,905 67 | |
| Arrearages due Florida militia, under General Read | 7,169 69 | 1,000 00 | 6,169 69 |
| of pay of Kentucky volunteers in 1836 | 1,000 00 | | 1,000 00 |

No. 6—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Arrearages of pay of volunteers in Black Hawk war | $870 60 | | $870 00 |
| of pay due Captain McRae's company of Virginia volunteers | 2,771 97 | $2,771 97 | |
| Travelling allowance to volunteers | 26,152 05 | 10,000 00 | 16,152 05 |
| Forage, transportation, &c., 6 companies New Mexico volunteers and spy company, under General Garland | 47,905 49 | 47,905 49 | |
| Subsistence of 11 regiments volunteers | 1,404 38 | 1,404 38 | |
| Three months' pay and allowance to Seminole warriors | 688 44 | | 688 44 |
| Pay of 11 regiments volunteers | 208 18 | | 208 18 |
| Purchase of gunpowder for the Pacific coast | 3,047 50 | 3,047 50 | |
| Civil fund of California | 665 16 | 665 16 | |
| Refunding to the State of California expenses incurred in suppressing Indian hostilities prior to January 1, 1854 | 60,151 28 | 60,151 28 | |
| Preventing and suppressing Indian hostilities | 3,254 81 | 3,254 81 | |
| Removal and subsistence of Indians now in Florida | 207,966 35 | 17,000 00 | 190,966 35 |
| Repressing Seminole hostilities | 1,076 77 | 1,076 77 | |
| Claims of the State of Georgia for military services from 1835 to 1838 | 7,112 94 | 7,112 94 | |
| Refunding to the Territory of Utah expenses incurred in suppressing Indian hostilities | 1,250 00 | 1,250 00 | |
| Mexican hostilities | 95,228 46 | 95,228 46 | |
| Military contributions in Mexico | 31,476 63 | 31,476 63 | |
| Arrearages prior to July, 1815 | 9,025 10 | 9,025 10 | |
| Purchase of camels | 490 10 | 490 10 | |
| Instruments for corps of topographical engineers | 18,336 42 | 18,336 42 | |
| Printing book of tactics | 5,176 29 | 5,176 29 | |
| Contingent expenses of the Adjutant General's department | 573 76 | 573 76 | |
| Compensation of clerk and messenger in the office of the Commanding General | 1,000 00 | 1,000 00 | |

| | | | |
|---|---|---|---|
| Continuing experiment of sinking artesian wells | 45,129 57 | 45,129 57 | ..... |
| Artesian well at Fort Monroe | 10,000 00 | 10,000 00 | ..... |
| Testing gun metal for heavy cannon | 11,200 00 | 11,200 00 | ..... |
| Payment to the State of Arkansas for expenses paid to resist incursions of the Cherokee Indians | 1,212 00 | 1,212 00 | ..... |
| Settlement of expenses incurred by the militia called into service in the Territory of New Mexico by Acting Governor Messervey | 1,774 59 | 1,774 59 | ..... |
| Payment of commissioners on military expenses in Oregon | 287 59 | 287 59 | ..... |
| Carrying into effect "joint resolution directing the payment of certain volunteers and militia under the limitations prescribed therein" | 4,000 00 | 4,000 00 | ..... |
| Sick and discharged soldiers | 50 00 | 50 00 | ..... |
| Survey of ship canal across peninsula of Florida | 26 58 | ..... | 26 58 |
| Defence of San Francisco | 13 15 | 13 15 | ..... |
| Cannon for sea coast defence | 500 00 | 500 00 | ..... |
| Relief of Whitemarsh B. Seabrook and others | 34,302 86 | 34,302 86 | ..... |
| | 11,542,115 79 | 9,851,777 78 | 1,690,338 01 |

## No. 7.

*Statement of the balances of appropriations on January* 22, 1858, *under the control of the Navy Department; the amounts (estimated) that may be required for the service of the government to the* 30*th June*, 1858, *and the amounts (estimated) applicable to the service of the fiscal year ending June* 30, 1859.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Pay of the navy | $2,129,440 18 | $1,900,000 00 | $229,440 18 |
| Clothing | 298,806 62 | 200,000 00 | 98,806 62 |
| Provisions | 439,558 72 | 350,000 00 | 89,558 72 |
| Pay of superintendents | 105,543 45 | 55,000 00 | 50,543 45 |
| Surgeons' necessaries | 19,073 54 | 12,000 00 | 7,073 54 |
| Contingent expenses | 155,941 26 | 155,941 26 | ..... |
| Increase, repairs, &c. | 1,745,485 86 | 1,160,000 00 | 585,485 86 |
| Six first-class steam frigates | 1,458,410 94 | 200,000 00 | 1,258.410 94 |
| Five sloops-of-war | 922,961 00 | 700,000 00 | 222,961 00 |
| Steam mail service | 913,003 45 | 488,175 00 | 424,828 45 |
| Naval Academy | 4,964 71 | 4,964 71 | ..... |
| Navy yard at Portsmouth, New Hampshire | 118,337 34 | 60,000 00 | 58,337 34 |
| Boston, Massachusetts | 290,008 51 | 225,000 00 | 65,008 51 |
| New York, New York | 267,288 09 | 200,000 00 | 67,288 09 |
| Philadelphia, Pennsylvania | 42,723 77 | 25,000 00 | 17,723 77 |
| Washington, Dist. Col. | 86,697 14 | 75,000 00 | 11,697 14 |
| Norfolk, Virginia | 79,952 42 | 79,952 42 | ..... |
| Pensacola, Florida | 156,611 92 | 100,000 00 | 56,611 92 |
| Sackett's Harbor, New York | 3,662 09 | 1,000 00 | 2,662 09 |
| Mare island, California | 98,835 80 | 98,835 80 | ..... |

| | | | |
|---|---|---|---|
| Basin and railway in California | 15,000 00 | 15,000 00 | |
| Construction of a sewer on Flushing avenue | 60,000 00 | | 60,000 00 |
| Magazine at Portsmouth, New Hampshire | 16,064 00 | 12,000 00 | 4,064 00 |
| Boston, Massachusetts | 17,717 43 | 10,000 00 | 7,717 43 |
| New York, New York | 40,925 77 | 25,000 00 | 15,925 77 |
| Philadelphia, Pennsylvania | 11,616 88 | 8,000 00 | 3,616 88 |
| Washington, Dist. Col. | 44,236 47 | 20,000 00 | 24,236 47 |
| Norfolk, Virginia | 59,819 86 | 25,000 00 | 34,819 86 |
| Pensacola, Florida | 5,039 68 | 2,000 00 | 3,039 68 |
| Hospital at Boston, Massachusetts | 4,146 71 | 3,000 00 | 1,146 71 |
| New York, New York | 4,081 20 | 3,000 00 | 1,081 20 |
| Philadelphia, Pennsylvania | 25,884 92 | 12,000 00 | 13,884 92 |
| Norfolk, Virginia | 8,920 00 | 7,000 00 | 1,920 00 |
| Pensacola, Florida | 19,064 79 | 10,000 00 | 9,064 79 |
| Hospital fund | 46,843 94 | 12,500 00 | 34,343 94 |
| Marine corps, pay of | 156,085 34 | 80,000 00 | 76,085 34 |
| clothing for | 376 59 | 376 59 | |
| fuel for | 15,000 00 | 15,000 00 | |
| military stores for | 5,000 00 | 5,000 00 | |
| transportation and recruiting the | 5,000 00 | 5,000 00 | |
| repairs of barracks, &c., for | 10,000 00 | 10,000 00 | |
| contingencies of | 5,000 00 | 5,000 00 | |
| Marine barracks at Brooklyn, New York | 96,000 00 | | 96,000 00 |
| Pensacola, Florida | 59,500 00 | 45,000 00 | 14,500 00 |
| Stevens' war steamer | 79,475 09 | | 79,475 09 |
| Search after the Arctic expedition | 7,811 37 | 7,811 37 | |
| American Nautical Almanac | 24,477 74 | 20,000 00 | 4,477 74 |
| Meteorological observations | 2,375 00 | 1,875 00 | 500 00 |
| Purchase of nautical instruments | 5,820 66 | 5,820 66 | |
| Printing and publishing Sailing Directions | 37,237 00 | 30,000 00 | 7,237 00 |
| Publication of Wind and Current Charts | 16,929 32 | 10,000 00 | 6,929 32 |
| Contingent expenses and wages in Observatory and Hydrographical Office | 11,342 41 | 8,000 00 | 3,342 41 |
| Publishing charts, &c., of La Plata river | 18,806 09 | 18,806 09 | |
| Testing improvements in steam boilers | 6,273 13 | 4,000 00 | 2,273 13 |
| Testing useful inventions and discoveries | 9,402 59 | 4,000 00 | 5,402 59 |
| Mexican hostilities | 30,736 23 | 3,000 00 | 27,736 23 |
| Military contributions in Mexico | 4,466 56 | 2,500 00 | 1,966 56 |
| Prize money to captors during the war with Mexico | 31,573 59 | 1,573 59 | 30,000 00 |
| Arming and manning the ordnance ship Plymouth | 29,571 36 | 29,571 36 | |

No. 7—Continued.

| Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|
| Pay of dropped naval officers | $13,250 00 | $13,250 00 | ---------- |
| Arranging, &c., specimens of natural history | 13,095 26 | 10,000 00 | $3,095 26 |
| Exploration of the Parana and tributaries of Paraguay river | 25,000 00 | 10,000 00 | 15,000 00 |
| Naval depot at Blythe island | 69,914 63 | 15,000 00 | 54,914 63 |
| Survey of the coast from Apalachicola bay to mouth of the Mississippi river | 1,760 49 | 1,760 49 | ---------- |
| Books, maps, &c. | 911 96 | 911 96 | ---------- |
| Coal depot at Key West, Florida | 158 93 | 158 93 | ---------- |
| Exploration and verification of the surveys, &c., of a ship canal near the Isthmus of Darien | 17,581 50 | 17,581 50 | ---------- |
| Dry dock at Philadelphia, Pennsylvania | 1,319 95 | 1,319 95 | ---------- |
| | 10,527,921 25 | 6,637,686 68 | 3,890,234 57 |

RECAPITULATION.

*Balances of appropriations on January* 22, 1858; *the amounts (estimated) that may be required for the service of the government to June* 30, 1858, *and the amounts (estimated) applicable to the service of the fiscal year ending June* 30, 1859.

| Number. | Heads of appropriations. | Balances of appropriations January 22, 1858. | Amounts (estimated) that may be required for the service of the government to June 30, 1858. | Amounts (estimated) applicable to the service of the year ending June 30, 1859. |
|---|---|---|---|---|
| 1 | State Department: Civil and foreign intercourse | $1,313,093 43 | $605,168 77 | $707,924 66 |
| 2 | Treasury Department: Civil, miscellaneous, and public debt | 6,777,894 91 | 3,999,478 09 | 2,778,416 82 |
| 3 | Treasury Department: Customs | 6,348,521 44 | 3,349,621 27 | 2,998,900 17 |
| 4 | Interior Department: Civil and miscellaneous | 3,198,069 11 | 1,849,043 16 | 1,349,025 95 |
| 5 | Interior Department: Pensions and Indian affairs | 4,412,649 69 | 3,510,489 36 | 902,160 33 |
| 6 | War Department | 11,542,115 79 | 9,851,777 78 | 1,690,338 01 |
| 7 | Navy Department | 10,527,921 25 | 6,637,686 68 | 3,890,234 57 |
| | | 44,120,265 62 | 29,803,265 11 | 14,317,000 51 |

C. T. JONES, *Acting Register*.

TREASURY DEPARTMENT, *Register's Office, February* 26, 1858.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 73.

# MEMORIAL AND JOINT RESOLUTION

OF THE

# LEGISLATIVE ASSEMBLY OF NEBRASKA,

PRAYING FOR

*An appropriation to bridge the Platte river.*

MARCH 4, 1858.—Referred to the Committee on Territories.

MEMORIAL AND JOINT RESOLUTION.

*To the honorable the Senate and House of Representatives of the Congress of the United States:*

Your memorialists, the council and house of representatives of the Territory of Nebraska, now assembled, would most respectfully represent that the interests of the people of this Territory and of the country at large would be greatly subserved by the appropriation of ——— ——— dollars for the purpose of bridging the Great Platte or Nebraska river, at some point within fifty miles of its mouth.

The reasons which might be urged in favor of this appropriation are many and obvious. Your memorialists, however, wish to call attention to a few of them.

*First.* Owing to the uncertainty of the soil in which this river makes its bed no reliable ferry can be established across it, the current often changing in a single night, and large and impassable sand bars are found where twenty-four hours before no obstruction was offered to the passage of ferry boats; thus virtually one portion of the Territory is separated from the other to the great detriment of their social relations and commercial pursuits.

*Second.* The Platte river being thus a barrier to the free, social and commercial intercourse of the two sections of the Territory which it separates, has been a fruitful and ceaseless source of dissention and strife between our people, giving rise to most if not all of the political troubles which have disturbed our Territory.

*Third.* In compliance with the known wishes of the people of the Territory, your memorialists have passed an act to re-locate the seat of government at a point in the valley of the Platte river, to be hereafter selected; and in order that the said capital may be accessible to

all parts of the Territory and no barrier exist to the free intercourse of the people north and south of that river, such bridge is absolutely necessary.

*Fourth.* Said river is a serious obstacle in the way of military operations and of the efficient construction of important roads required by the wants of that branch of the government service.

Other reasons might be urged in support of such an appropriation, but your memorialists cannot but believe that its necessity will be apparent to your honorable bodies, and therefore respectfully urge your early action in the matter; and, as in duty bound, they will ever pray, &c.

*Resolved by the council and house of representatives of the Territory of Nebraska,* That this memorial and joint resolution be signed by the president of the council and speaker of the house of representatives, and copies thereof forwarded to the President of the Senate of the United States, the Speaker of the House of Representatives, and our delegate in Congress.

J. H. DECKER,
*Speaker of the House of Representatives.*
LEAVITT L. BOWEN,
*President of the Council.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 74.

# ERECTION OF PUBLIC BUILDINGS IN TRENTON, NEW JERSEY.

## RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF NEW JERSEY,

RELATIVE TO

*The erection of public buildings in the city of Trenton, New Jersey.*

MARCH 9, 1858.—Referred to the Committee on the Judiciary.

STATE OF NEW JERSEY.

JOINT RESOLUTIONS relative to the erection of public buildings in the city of Trenton, by the general government.

Whereas the public welfare would be promoted by having at Trenton a suitable building in which to hold the United States courts, where all the records pertaining to said courts could be kept, and in which the collector and postmaster could have convenient offices; therefore—

1. *Be it resolved by the senate and general assembly of the State of New Jersey*, That the senators and representatives in Congress from this State be requested to use their exertions to obtain from the general government a sufficient appropriation to purchase a proper site, and to erect thereon such a building, at Trenton.

2. *And be it resolved*, That inasmuch as the production and manufacture of iron are pursuits in which the people of this State and of all the middle States have a large interest, it is fitting that all the encouragement which can be constitutionally given by government to this great branch of public industry should be accorded to it, especially that enlargement of the home market which a judicious direction of the public expenditure in the use of iron for building purposes would create, we therefore join with the citizens of Trenton in advising that the building above named be of iron.

3. *And be it resolved*, That the governor be requested to send a copy of the foregoing preamble and resolutions to each of the senators and representatives in Congress from this State.

Approved February 24, 1858.

STATE OF NEW JERSEY:

I, Thomas S. Allison, secretary of state of the State of New Jersey, do hereby certify that the foregoing is a true copy of a preamble and joint resolutions passed by the legislature of this State, and approved February 24, 1858, as taken from and compared with the original, now on file in my office.

In testimony whereof, I have hereunto set my hand, and affixed my official seal, at Trenton, in said State, this fifth day of [SEAL.] March, A. D. one thousand eight hundred and fifty-eight.

THOMAS S. ALLISON,
*Secretary of State.*

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EXECUTIVE DEPARTMENT OF NEW JERSEY,
*Trenton, New Jersey, March* 5, 1858.

I have the honor to transmit herewith a copy of joint resolutions passed by the legislature of this State, agreeably to the requirements of said resolutions.

Most respectfully, your obedient servant,

WM. A. NEWELL,
*Governor of New Jersey.*

Hon. GEORGE R. ROBBINS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 75.

# MILITARY POST AT JUNCTION OF WICHITA AND RED RIVERS.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF TEXAS,

ASKING FOR

*The establishment of a military post at or near the junction of the Wichita and Red rivers, &c., &c.*

MARCH 11, 1858.—That part relating to the military post referred to the Committee on Military Affairs, and that part relating to the Indians referred to the Committee on Indian Affairs.

JOINT RESOLUTION.

Whereas it is a fact ascertained to the satisfaction of the governor, that the depredations committed upon the frontier citizens of this State is done chiefly by United States Indians, who enter our Territory about the junction of the larger Wichita and Red rivers, near which there is no military station or post; and whereas it is believed by many well informed citizens living on the frontier that the Camanche and other Indians, who are fed by the United States on the Texas Indian reserve, are also directly or indirectly engaged with them in those hostile forays which is rendering the civilizing and feeding policy of the government unpopular, if not useless, which would not be so if it were efficiently carried out: therefore—

*Be it resolved by the legislature of the State of Texas*, That the governor be, and he is hereby, requested to urge upon the authorities of the federal government at Washington, the great necessity of the immediate establishment of a military post as near the junction of the larger Wichita and Red rivers as practicable, and that the Indian agents in charge of the Indians on the Texas Indian reserve be instructed to require every male Indian over the age of twelve years to be upon the reserve under his control every day, unless such Indian or Indians have his special written permission to be absent; and

that such agents be instructed not to permit any Indian or Indians to be absent from said reservations by special permission more than three days, at any time, unless they are accompanied by some white man or men, to be sent with them by them, to prevent them from committing depredations on the citizens of the country, or communicating with other Indians not known to be at peace with Texas, or sent with white men as guides, hunters, &c., or sent by said agents as spies or express bearers; and that the agents be required to enforce these instructions, and that the government furnish and keep constantly at each reserve a sufficient military force to enable the agents to carry out such instructions; and that our senators and representatives in Congress be requested to co-operate with the governor in accomplishing the objects of this resolution; and that the governor be requested to furnish each of them, and the President, and Secretary of War, and Secretary of the Interior of the United States with a copy of the same.

Approved January 29, 1858.

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DEPARTMENT OF STATE, AUSTIN, TEXAS,
*February* 1, 1858.

I, the undersigned, secretary of state of the State of Texas, do hereby certify that the above and foregoing is a correct copy of the original joint resolution on file in the department of state.

Given under my hand and the seal of the department of state the [L. S.] day and year first above written.

T. S. ANDERSON,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 76.

# INDIANS IN TEXAS.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF TEXAS,

RELATING TO

*Indians west of the Pecos river.*

MARCH 11, 1858.—Referred to the Committee on Indian Affairs.

JOINT RESOLUTION instructing the senators and requesting the representatives of Texas in Congress to procure such action on the part of the United Sates as will cause the Indians in Texas west of the Pecos river to be collected upon the reserve provided for them.

Whereas the Indians within the limits of Texas west of the Pecos river are of a roving character, without permanent habitation, and subsist mainly by depredations upon the stock and other property of the citizens of Texas residing in that portion of the State, and whereas the State of Texas has made a liberal provision for said Indians by an appropriation of land to be selected by an agent for them, to be appointed by the United States government for the purpose of collecting and permanently settling them thereon, and there to be taught the arts of agriculture and civilization under the superintendence, control, and management of said agent, whereby the citizens of the State will be relieved from the continued losses sustained by the predatory incursions of said Indians: therefore—

*Be it resolved by the legislature of the State of Texas*, That our senators and representatives in Congress be requested to use all proper means to procure the appointment by the government of the United States of a competent agent to select a proper location west of the Pecos river, within the limits of Texas, upon which to settle the Indians inhabiting that section of the State, in accordance with the provisions of "An act supplementary to an act entitled 'An act relating to the Indians cf Texas,' approved February 6, 1854," approved February, 1856, and that said agent be instructed to collect and settle said Indians upon such location so made as aforesaid.

*Be it further resolved*, That his excellency the governor be requested to forward a copy of these resolutions to each of our senators and representatives in Congress.

Approved January 29, 1858.

DEPARTMENT OF STATE,
*Austin, Texas, February* 1, 1858.

I, the undersigned, secretary of state of the State of Texas, do hereby certify that the transcript on the reverse hereof is a correct copy of the original joint resolution on file in the department of state.

Given under my hand and the seal of the department of State the [L. S.] day and year first above written.

T. S. ANDERSON,
*Secretary of State.*

# RESOLUTION

OF THE

# GISLATURE OF THE STATE OF RHODE ISLAND,

RELATIVE

*a distribution of the public lands among the several States, for the benefit of agriculture and the mechanic arts.*

MARCH 12, 1858.—Ordered to be printed.

STATE OF RHODE ISLAND AND PROVIDENDE PLANTATIONS,

JANUARY SESSION, A. D. 1858.

lution relative to the appropriating of public lands of the United States for the benefit of agriculture and the mechanic arts.

*esolved*, That the senators from this State be instructed, and the esentatives be requested, to use their exertions in Congress for passage of an act donating public lands to the several States and itories in the Union, for the aid and encouragement of scientific ation in agriculture and the mechanic arts.

*esolved*, That the secretary of state be instructed to transmit a of the above resolution to each of the members of Congress from State, immediately after its passage.

true copy. Attest:

the United States, for the donation of public lands to the several States and Territories in the Union, which may provide colleges for the benefit of agriculture and the mechanic arts.

With high respect, I have the honor to remain your most obedient servant,

JOHN R. BARTLETT,
*Secretary of State.*

Hon. N. B. DURFEE, M. C.,
*Washington City.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 78.

# COD FISHERIES.

## RESOLUTIONS

OF

## THE LEGISLATURE OF THE STATE OF MAINE,

RELATIVE

*To bounty on cod fisheries.*

MARCH 12, 1858.—Referred to the Committee on Commerce.

STATE OF MAINE.

RESOLVES relative to bounty on cod fisheries.

Whereas a bill has been proposed in Congress to repeal the act allowing bounties to vessels employed in the cod fisheries, the passage of which will greatly injure, if not destroy, one of the most important interests of this State, and one which affords employment to thousands of our hardy citizens; and

Whereas the passage of such a bill will have the effect to render almost, if not entirely, useless a large class of vessels which, from their peculiar build and model, cannot be successfully employed in other business, and which have been built under what was supposed to be a well-founded reliance upon the continuance of a policy which places us more nearly upon a level with those of other nations engaged in the same business, whose governments bestow a more liberal bounty thereon than our own; and

Whereas our past history abundantly proves that the cod fisheries afford the cheapest, best, and most efficient schools for manning our navy in time of war: Therefore—

*Resolved*, That the repeal of the law granting bounties to vessels employed in the fishing business will be unjust and oppressive to those induced by the existence of the law to embark a large amount of capital therein, and at the same time will, in a national point of view, be impolitic and unwise, inasmuch as we shall thereby be deprived, in case of war, of the most reliable source for a supply of American seamen.

*Resolved*, That our senators and representatives in Congress be

# POSTAL LAWS.

## RESOLUTION

OF

## THE LEGISLATURE OF THE STAE OF TENNESSEE,

RELATIVE TO

*The postal laws of the United States.*

MARCH 15, 1858.—Referred to the Committee on the Post Office and Post Roads.

RESOLUTION instructing the delegation from Tennessee in relation to the postal laws.

*Resolved by the general assembly of the State of Tennessee*, That our senators in Congress be instructed, and our representatives be requested to use all possible means to so amend the postage laws as to allow any person to endorse his or her name on any public document or newspaper he or she may desire to forward to any person or place in the United States, and that his excellency the governor be requested to forward copies of this resolution to each of our said senators and representatives in Congress.

Adopted February 12, 1858.

DAN'L S. DONELSON,
*Speaker of the House of Representatives.*
JNO. C. BURCH,
*Speaker of the Senate.*

I, F. N. W. Burton, secretary of state, do hereby certify the foregoing is a true copy of the original resolution on file in my office.

In witness whereof, I have hereunto set my hand and affixed the [L. S.] great seal of the State, this 15th day of February, A. D. 1858.

F. N. W. BURTON,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 81.

KANSAS, &c.

# JOINT RESOLUTIONS

OF THE

# LEGISLATURE OF THE STATE OF TENNESSEE,

*Instructing her senators and requesting her representatives to vote for the admission of Kansas under the Lecompton constitution, and in reference to the Hon. John Bell.*

MARCH 15, 1858.—Ordered to be printed.

## JOINT RESOLUTIONS.

Whereas the act of 1820, commonly called the Missouri compromise act, was inconsistent with the principles declared and laid down in the acts of 1850, better known as the compromise acts of that year; and whereas the Missouri compromise act was a palpable wrong done to the people of the slaveholding States, and should have been repealed; and whereas the principles of the Kansas-Nebraska bill meet our unqualified approbation, and should have received the cordial support of our senators and representatives in Congress:

Whereas one of those senators, Hon. John Bell, in a speech delivered against the Kansas-Nebraska bill, May 25, 1854, said: "A noble, generous, and high-minded senator from the south, within the last few days before the final vote was taken on the bill, appealed to me in a manner which I cannot narrate, and which affected me most deeply. The recollection of it affects and influences my feelings now and ever will. I told the honorable senator that there was one feature in the bill which made it impossible that I should vote for it, if I waived all other objections. I said to others who had made appeals to me on the subject, that while it would afford me great pleasure to be sustained by my constituents, yet, if I was not, I would resign my seat here the moment I found my course upon this subject was not acceptable to them. As for my standing as a public man, and whatever prospect a public man of long service in the councils of the country might be supposed to have, I would resign them all with pleasure. I told that gentleman, that if upon this, or any other great

question affecting the interest of the south, I should find my views conflicting materially with what should appear to be the settled sentiment of that section, I should feel it my imperative duty to retire.

"I declare here to-day that if my countrymen of Tennessee shall declare against my course on this subject, and that shall be ascertained to a reasonable certainty, I will not be seen in the Senate a day afterwards:" Therefore—

*Be it resolved by the general assembly of the State of Tennessee*, That we fully concur with the Hon. John Bell as to the duty of a senator, when the voice of his constituency has decided against him on a question materially affecting their interest.

*Be it further resolved*, That, in our opinion, the voice of Mr. Bell's countrymen of Tennessee, in the recent elections, has declared against his course on the Kansas-Nebraska bill, a question of vital importance to the south.

*Be it further resolved*, That our senators in the Congress of the United States are hereby instructed, and our representatives are requested, to vote for the admission of Kansas as an independent State, under what is termed the Lecompton constitution, transmitted to the Senate and House of Representatives in Congress assembled by President Buchanan in message to them, dated the 2d of February, 1858.

*Be it further resolved*, That the governor of this State forward a certified copy of these resolutions to our senators and representatives in the Congress of the United States.

Adopted February 10, 1858.

DAN'L S. DONELSON,
*Speaker of the House of Representatives.*
JNO. C. BURCH,
*Speaker of the Senate.*

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I, F. N. W. Burton, secretary of the State of Tennessee, do hereby certify that the foregoing is a true copy of the original resolutions in my office.

In witness whereof, I have hereunto set my hand and affixed the great seal of the State, this twelfth day of February, A. D. 1858. [L. S.]

F. N. W. BURTON,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 82.

# PUBLIC LANDS FOR SCHOOL PURPOSES.

## PREAMBLE AND RESOLUTION

OF THE

## KENTUCKY AGRICULTURAL SOCIETY,

IN RELATION TO

*The appropriating of a portion of the public domain for school purposes.*

MARCH 15, 1858.—Referred to the Committee on Public Lands.

PIERCE VALLEY, *February* 19, 1858.

SIR: Your attention is respectfully asked to the following preamble and resolution passed unanimously by the board of directors of the Kentucky State Agricultural Society, at a meeting held in the city of Frankfort, on the 10th to the 13th instant:

"Whereas a bill has been introduced into the Congress of the United States appropriating a portion of the national domain for the endowment of a school, in each State of the Union, for the education of farmers and mechanics: Therefore, as the sense of this board—

"*Resolved*, That the Kentucky State Agricultural Society, and the farmers and mechanics of Kentucky, do most cordially approve of said measure, so far as it is known to them, without distinction of party as to national politics, and that our senators and representatives in Congress are requested to use all reasonable and honorable efforts to promote its passage."

Respectfully, yours, &c.,

W. D. GALLAGHER,
*Secretary Kentucky State Agricultural Society.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 83.

# ADDITIONAL TOWNSHIP OF LAND FOR SEMINARY OF LEARNING.

## RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF MISSOURI,

IN RELATION TO

*Lands for seminary of learning.*

MARCH 16, 1858.—Referred to the Committee on Public Lands.

SENATE OF MISSOURI.

*Report of special committee.*

MR. PRESIDENT: The special committee appointed "to examine and ascertain whether this State is entitled from the general government to an additional township of land for the use of a seminary of learning, and report the result of their investigations to the senate, together with such measures as they may deem advisable to obtain the same if so entitled," beg leave to report that the fifth proposition of the act of Congress to form a State constitution, and for the admission of this State into the Union, which, with the other propositions in said act, was accepted in its exact language by our ordinance, provides "that thirty-six sections, or *one* entire township, which shall be designated by the President of the United States, *together with the other lands heretofore reserved* for that purpose, shall be reserved for a seminary of learning, and *vested* in the legislature of said State, to be appropriated solely to the use of such seminary by the said legislature."

The act of Congress for the admission of Missouri there gives us *one* township for the use of a seminary of learning, and *only one* township, unless there were *other* lands theretofore reserved for that purpose, but it as certainly gives us *all other* lands theretofore reserved for that purpose; not a part of the other lands theretofore reserved, but *the other lands* (that is, *all* other lands) heretofore reserved.

What were "*the other lands*" theretofore reserved, *together* with which the *one* township granted for the first time in the act of Congress for our admission, and our ordinance accepting it, was to constitute our seminary fund?

The seventh section of the act of Congress of March 3, 1811, provides that "*one* entire township shall be located and reserved in the Territory of Louisiana, for the support of a seminary of learning within the said Territory. The Territory of Louisiana afterwards became the Territory of Missouri."—(Act of Congress June 4, 1812.)

On the 17th of July, 1818, Congress passed an act entitled "An act making provision for additional land offices *in the Territory of Missouri*," which provides "that, instead of *one* township for the support of a seminary of learning, there shall be *two* townships located for *the purpose* by the Secretary of the Treasury and reserved from sale;" this was in 1818, *before* the act of Congress and our ordinance admitting Missouri into the Union in the year 1820. Thus we see there were *two townships* reserved for the use of our seminary of learning in the Territory of Missouri previous to the act of admission. It does not matter that the law of 1818 provided that one of the sections should be located on the waters of the Missouri, and the other on the waters of the Arkansas. They were both, and the one as well as the other, *reserved* for the use of a seminary of learning *in Missouri;* and if Congress had chosen to do so, it might have required that both townships should be located in the Territory of Illinois for the purpose indicated, and the grant would have been perfect and our title good. But within the Territory of Missouri, and now within the State, it was very easy to find the waters of the Arkansas; the great southwest is drained by its tributaries. Whatever we obtain we derive from the compact, (the act of admission and the ordinance accepting it;) this gives us *one* township originally, and also the other lands theretofore reserved for that purpose, viz: the two townships reserved by the law of 1818, making, together with the one given by the act of admission, *three* townships instead of two only, which is all we have obtained. We *have* received two townships, which two of the three above recited are these? The two previously reserved in the act of 1818, or one of these, and the one granted for the first time in the act of admission. If the two first mentioned, (reserved by the law of 1818,) nobody will hesitate to declare that we are entitled to the one specifically given in the act of admission, to be designated by the President of the United States. If this one, and one of the others reserved in the law of 1818, (which *one* of these two there reserved in the law of 1818 is the township obtained,) and if either of these constitute one of the two townships already received, we have an equal and the same right to the other, because both are granted by the same law, for the same purpose, and in the same terms.

In conclusion, the committee have no hesitation in declaring that we have a clear and undeniable right from the general government to an additional township of land for the use of a seminary of learning, a right acquired under the compact for the admission of Missouri into

the Union, and which could not be taken away or violated, any more than any other right acquired under said compact by any subsequent act of Congress.

The act of Congress entitled "An act concerning the selection of certain lands heretofore granted by compact to the State of Missouri for seminaries of learning," approved January 24, 1827, directed the President to cause to be selected from any of the public lands of the United States in Missouri "the several townships of land heretofore secured by compact to the State of Missouri," for the purposes of a seminary or seminaries in that State, "and the lands so located were at once, on the selection, to *vest* in the State in accordance with and satisfaction of the compact." Under this act the *three* townships would no doubt have been selected and vested in the State, instead of only *two*, which were selected in 1828, except for the passage of the act of Congress, approved March 2, 1827, entitled "An act concerning a seminary of learning in the Territory of Arkansas," in which, under a singular misapprehension of the law of 1818, and a plain mistake and misstatement of its language, one of the two townships given to Arkansas for seminary purposes, in that law of March 2, 1827, is declared to be "in lieu of an entire township of land directed to be located on the waters of the Arkansas river, in said Territory," (meaning Arkansas) for the use of a seminary of learning *therein*, by an act of Congress entitled "An act making provision for the establishment of additional land offices in the Territory of Missouri," approved February 17, 1818. It only needs a recurrence to the compact and the law of 1818 to see plainly that this act of March 2, 1827, in regard to Arkansas, misstates the law of 1818, and gave to Arkansas one entire township of land which clearly belonged to Missouri.

Your committee, believing that we are fully entitled, under existing laws, to this additional township, and that, upon application to the President of the United States, it is made his duty to cause the same to be designated and selected, (act of Congress, approved January 24, 1827,) recommend that the governor of the State of Missouri be requested to make application to the President of the United States to cause to be selected, as provided in the said act of January 24, 1827, said township of land; and, in case the President does not cause the same to be selected, that our senators and representatives in Congress be requested to procure the passage of an act recognizing the right of the State of Missouri to an additional township of land for the use of a seminary of learning in said State, and providing for the selection and designation of said lands at as early a period as practicable; and that the same, in view of the fact that the most valuable lands in this State are already sold or reserved from sale, may be selected out of any of the public lands of the United States; and to that end they submit and recommend the adoption of the accompanying joint resolution.

RANNELS, *Chairman.*

JOINT RESOLUTION in relation to an additional township of seminary land.

*Resolved by the senate and house of representatives of the State of Missouri*, That the governor of the State of Missouri be, and he is hereby, requested to make application to the President of the United States to cause to be selected, as provided in the act of Congress approved January 24, 1827, a township of land, in addition to the two already selected under this act, for the use of a seminary of learning in the State of Missouri; and in case the President of the United States, upon said application, does not cause the same to be selected, that our senators and representatives in Congress be requested to unite in procuring the passage of an act of Congress recognizing the right of the State of Missouri to an additional township of land for the use of a seminary of learning in this State, and providing for the designation and selection of said land at as early a period as practicable, and that the same (in view of the fact that the most valuable lands in the State are already sold or reserved from sale) may be selected from any of the public lands of the United States; and that a copy of this resolution, together with a copy of the report of the committee, be delivered to the governor of this State, and that copies thereof and of said report be transmitted, by the secretary of state, to each of our senators and representatives in Congress, as soon as practicable.

Approved November 18, 1857.

I, B. F. Massey, secretary of state, hereby certify the foregoing copy of a report and resolution is a true copy from the originals now on file in this office.

In testimony whereof, I have hereunto set my name and affixed the seal of office. Done at the city of Jefferson, at the office of secretary of state, this 15th day of February, 1858.

[SEAL.]

B. F. MASSEY,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 84.

# GRANT OF LAND FOR RAILROAD PURPOSES.

## MEMORIAL

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

IN FAVOR OF

*A grant of land to Lansing, Northern Iowa, and Southern Minnesota Railroad.*

MARCH 16, 1858.—Ordered to be printed.

**JOINT RESOLUTION asking Congress for a grant of land to aid in the construction of the Lansing, Northern Iowa, and Southern Minnesota Railroad.**

*Resolved by the general assembly of the State of Iowa*, That our senators in Congress be instructed, and our representatives be requested, to use their best exertions to procure the passage of a bill making a grant of land to aid in the construction of a railroad from Lansing, Alamakee county, Iowa, *via* Decorah, Winneshiek county, thence, through the county of Howard, Iowa, in a northwest direction, to the great bend of the St. Peter's river, in the Territory of Minnesota.

*Resolved*, That the secretary of state be instructed to forward a copy of the foregoing resolution to each of our senators and representatives in Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved February 16, 1858.

RALPH P. LOWE.

I hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 85.

# SPIRIT LAKE TROUBLES—PAY OF THE MILITIA.

## MEMORIAL AND JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

FOR

*Paying the militia in Spirit Lake troubles with Indians in March,* 1857.

MARCH 16, 1858.—Ordered to be printed.

MEMORIAL AND JOINT RESOLUTION asking Congress to appropriate a sum sufficient to the State of Iowa to indemnify the said State for all necessary expenses incurred in an expedition raised under authority of the govenor of the State of Iowa to relieve the settlements at Spirit Lake in March, A. D. 1857.

Your memorialists, the general assembly of the State of Iowa, would respectfully represent that, in consequence of the hostile invasion of the State by a band of Sioux Indians, in the month of March A. D. 1857, whereby a large number of the citizens of this State were brutally murdered and a considerable amount of property destroyed; and whereas, in order to protect the lives and property of the citizens of this State, it became necessary to raise, arm, and equip a company of men to march to the relief of the settlements; and whereas under the authority of the governor of this State a company of nearly one hundred men were so raised, armed, and equipped, and did march to the scene of the massacre, thereby incurring considerable expense and suffering almost unheard of hardships, and thereby relieving a number of families from starvation, and burying the bodies of the murdered.

Your memorialists would, therefore, respectfully ask of your honorable bodies that a law may be passed providing for the payment to the State of Iowa all the expenses incurred by the said State in consequnce of said hostile invasion as aforesaid.

*Resolved*, That the senators from this State be instructed, and the representatives be requested, to use their best exertions to procure the passage of a law appropriating a sum as asked for in the fore-

going memorial, and that the secretary of state forward a copy thereof to each.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved January 30, 1858.

RALPH P. LOWE.

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I certify that the foregoing is a true copy from the original on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 86.

# BOUNTY LAND TO MILITIA IN SPIRIT LAKE EXPEDITION.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

IN FAVOR OF

*Granting bounty land to militia in troubles with Indians at Spirit Lake, March*, 1857.

MARCH 16, 1858.—Ordered to be printed.

JOINT RESOLUTION to the Senate and House of Representatives of the United States, asking for bounty land warrants for the volunteers on the Spirit Lake expedition.

*To the Senate and House of Representatives of the United States:*

Your memorialists, the general assembly of the State of Iowa, respectfully represent: That, whereas some time in March, 1857, a party of Sioux Indians attacked and destroyed the entire settlement at Spirit Lake, in Dickinson county, of this State; and whereas when the news reached Fort Dodge, a party of over one hundred men immediately put themselves under the command of Major William Williams, and marched to the scene of slaughter to protect the living, (if any had survived the general massacre,) give the dead a Christian burial, and punish the savage intruders; and whereas this party of volunteers endured almost unheard of hardships, being on the continued march for eighteen days, crossing swollen streams, marching over drifted snow, and over an almost pathless prairie, alike destitute of timber and inhabitants, and this, too, in the most inclement weather, so cold that two of the number, Captain J. C. Johnson and William Buckholder, perished, and were lost on the prairie, while all underwent almost unendurable hardships, many being frozen and maimed for life; and whereas, by the self-sacrificing perseverance of these men, several families in southern Minnesota were rescued from the perils of savage warfare, and saved from death by starvation, and the victims of Indian butchery were decently interred.

Therefore your memorialists petition that you give and grant to each person engaged upon that expedition who received an honorable discharge, a military bounty land warrant, calling for one hundred

and sixty acres of land, and provided that said warrant can be located on any land upon which the Indian title is extinguished, has been surveyed, and is not otherwise appropriated; and your memorialists would further petition that the heirs of Captain J. C. Johnson be given and granted one section of government land, to be selected by said heirs, from any land as above described; and that the heirs of William Buckholder be given and granted one section, to be selected by said heirs as above prayed for in the case of Captain Johnson.

*Resolved*, That the secretary of state be instructed to forward a copy of the above to Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Reps.*
ORAN FAVILLE,
*President of the Senate.*

Approved January 30, 1858.

RALPH P. LOWE.

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OFFICE OF THE SECRETARY OF STATE,
*Des Moines, February* 1, 1858.

I, Elijah Sells, secretary of state of the State of Iowa, hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 87.

# LAND FOR A RAILROAD.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

ASKING

*Congress for a grant of land to aid in the construction of a certain railroad.*

MARCH 16, 1858.—Ordered to be printed.

JOINT RESOLUTTION asking Congress for a grant of land to aid in the construction of a certain railroad.

Whereas a grant of land was made to the Territory of Minnesota by the thirty-fourth Congress of the United States, to aid in the construction, among others, of a railroad from St. Paul, via Minneapolis, to the southern boundary of the Territory in the direction of the mouth of the Big Sioux river; and whereas the greater part of the northwest portion of the State of Iowa lying between the west branch of the Des Moines and Big Sioux rivers is a vast prairie, fertile and well watered, but almost entirely destitute of timber, and, for this reason, not likely to be settled for many years without the aid of a railroad: Now, therefore—

*Resolved by the general assembly of the State of Iowa*, That our senators in Congress be instructed, and our representatives be requested, to use their best exertions to procure the passage of a bill making a grant of land to aid in the construction of a railroad from the north line of the State of Iowa, at the point of intersection of the said above described railroad, with the said north line of the State, to Sioux city, on the Missouri river.

*Resolved*, That the secretary of state be instructed to forward a copy of the foregoing resolution to each of our senators and representatives in Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved February 20, 1858.

RALPH P. LOWE.

I hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 88.

# PUBLIC BUILDINGS AT BURLINGTON, IOWA.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

FOR

*An appropriation to build a custom-house, United States district court-house, and post office, in the city of Burlington.*

March 16, 1858.—Ordered to be printed.

JOINT RESOLUTION for an appropriation to build a custom-house, United States district court-house, and post office, in the city of Burlington.

*Resolved by the general assembly of the State of Iowa*, That our senators in Congress be instructed, and our representatives be requested, to use all proper means to secure an appropriation from the general government for the purpose of building a custom-house, United States district court-house, and post office, in the city of Burlington.

*Resolved*, That the secretary of state be requested to forward a certified copy of the above to each of our senators and representatives in Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved February 20, 1858.

RALPH P. LOWE.

OFFICE OF SECRETARY OF STATE,
*Des Moines, February* 22, 1858.

I hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 89.

# TO RESTRICT SALES OF LAND TO ACTUAL SETTLERS.

## MEMORIAL

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

TO

*Restrict sales of land to actual settlers.*

MARCH 16, 1858.—Ordered to be printed.

MEMORIAL of the general assembly of the State of Iowa to Congress, in favor of restricting the sale of public lands to actual settlers.

Your memorialists, the general assembly of the State of Iowa, respectfully represent that, in the opinion of this general assembly, the sale of public lands to other than actual settlers has materially retarded the growth and prosperity of our State; that many large tracts of our best lands have been purchased by speculators, and placed beyond the reach of the great mass of the emigrants who are seeking new homes within our borders, and thus sacrificing the interests of thousands of the enterprising and industrious poor for the benefit of a few non-producers.

Your memoralists will not attempt to enumerate the many evils which have resulted from this system, nor will they endeavor to portray the incalculable benefits that would accrue to the newer States and Territories from the proposed change.

Your memorialists also beg leave to represent that the sale of the public domain will be increased and rendered more uniform by thus facilitating its settlement and cultivation.

Your memorialists therefore pray your honorable body to adopt such measures as in your wisdom will best secure to actual settlers the exclusive right to purchase the public lands which are now, or may hereafter be offered for sale, and for this purpose request the

secretary of state to furnish a certified copy of this memorial to each of our members of Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved February 20, 1858.

RALPH P. LOWE.

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I hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS.
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 90.

# VANCOUVER—A PORT OF DELIVERY.

## JOINT RESOLUTION

OF

## THE TERRITORY OF WASHINGTON,

RELATIVE TO

*Making Vancouver a Port of Delivery.*

MARCH 16, 1858.—Referred to the Committee on Commerce.

JOINT RESOLUTION relative to making Vancouver a port of delivery

*Resolved by the legislative assembly of the Territory of Washington,* That our delegate in Congress be, and he is hereby, instructed to use his influence to secure the passage of a law making Vancouver, in Clarke county, Washington Territory, a port of delivery.

Passed January 11, 1858.

J. S. M. VAN CLEAVE,
*Speaker of the House of Representatives.*

C. C. PAGETT,
*President of the Council.*

SECRETARY'S OFFICE,
*Olympia, January* 25, 1858.

A true copy. Attest:

C. H. MASON,
*Secretary of Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 91.

# LUNATIC ALYLUM IN WASHINGTON TERRITORY.

## RESOLUTION

OF THE

## LEGISLATURE OF WASHINGTON TERRITORY,

PRAYING

*An appropriation or donation of land for the establishment of a lunatic asylum.*

MARCH 16, 1858.—Referred to the Committee on Public Lands.

RESOLUTION praying an appropriation or donation of land for the establishment of a lunatic asylum in Washington Territory.

*Resolved by the legislative assembly of the Territory of Washington*, That our delegate in Congress be, and he is hereby, instructed to use his influence with the Congress of the United States to procure the passage of an act appropriating a sum of money or making a grant of land for the erection of a lunatic asylum in Washington Territory.

Passed the house of representatives January 15, 1858.

J. S. M. VANCLEVE,
*Speaker of the House of Representatives.*

Passed the council January 16, 1858.

C. C. PAGETT,
*President of the Council.*

SECRETARY'S OFFICE,
*Olympia, January* 26, 1858.

A true copy.
Attest:

T. H. MUSON,
*Secretary of the Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 92.

# MARINE HOSPITAL IN WASHINGTON TERRITORY.

## RESOLUTION

OF THE

## LEGISLATURE OF WASHINGTON TERRITORY,

RELATIVE TO

*The establishment of a marine hospital in the Territory of Washington.*

MARCH 16, 1858.—Referred to the Committee on Commerce.

RESOLUTION relative to the establishment of a marine hospital in the Territory of Washington.

*Resolved by the legislative assembly of the Territory of Washington*, That our delegate in Congress be, and he is hereby, instructed to use his influence with the Congress of the United States to procure the passage of an act making an appropriation for the establishment of a marine hospital in Washington Territory.

Passed house of representatives January 15, 1858.

J. S. M. VANCLEVE,
*Speaker of the House of Representatives.*

Passed council January 18, 1858.

C. C. PAGETT,
*President of the Council.*

SECRETARY'S OFFICE,
*Olympia, January* 26, 1858.

A true copy. Attest:

C. H. MASON,
*Secretary of Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 93.

# RELIEF OF JAMES B. THOMAS AND FAMILY.

## MEMORIAL AND JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF IOWA,

FOR THE

*Relief of James B. Thomas and family.*

MARCH 16, 1858.—Ordered to be printed.

MEMORIAL AND JOINT RESOLUTION of the general assembly of the State of Iowa, to Congress, for the relief of James B. Thomas and family.

Whereas James B. Thomas, a natural born citizen of the United States, does most respectfully represent that, in consequence of the acts of a company of some forty Indians of the Sioux tribe, in the month of March, 1857, that he has been deprived of all his property, as set forth in the accompanying petition; and that one of his sons was instantly killed, and himself wounded in the arm, by the Indians.

The wound was of such a nature as to render the amputation of the limb necessary, in order to preserve his life. And that he also lost another child from the effects of the intense cold experienced while fleeing from the Indians for safety; and that he is now entirely destitute, and, in a great measure, unable to support his family.

Your memorialists would most respectfully ask your honorable body to grant a sufficient remuneration to said James B. Thomas and family, for the loss sustained in consequence of the barbarous acts of said Indians.

*Resolved by the general assembly of the State of Iowa,* That our senators and representatives in Congress be instructed and requested to use all their influence to procure the passage of an act for the relief of said James B. Thomas and family; and that, in view of the facts set forth in the memorial, we deem it but an act of common justice, on the part of the general government, to remunerate said Thomas and family for the property and loss sustained in consequence of Indian depredations.

*Resolved,* That the secretary of state forward a copy of the fore-

going resolution to each of our senators and representatives in Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved February 16, 1858.

RALPH P. LOWE.

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I herby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

# PUBLIC DEBT OF TEXAS.

## JOINT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF TEXAS,

IN RELATION TO

*Payment of Public Debt of Texas.*

MARCH 16, 1858.—Referred to the Committee on Ways and Means.

JOINT RESOLUTION.

Whereas there is a considerable balance remaining in the treasury of the United States of the appropriation made by the act of Congress providing for the payment of a certain portion of the public debt of Texas, passed on the 28th February, 1855, owing mainly to the loss of securities by holders of the same; and whereas, under these circumstances, those parties may never be able to make the necessary exhibition of Texas liabilities at that department to enable them to obtain the money due them, and will be compelled to apply to the State legislature for relief; and whereas Texas is entitled to any and all balances in the treasury of the United States which has not been paid to the creditors under the act of Congress above referred to, therefore—

*Be it resolved by the legislature of the State of Texas*, That our senators and representatives in Congress be, and they are hereby, requested to use every exertion in their power to obtain the passage of a law by Congress authorizing the payment of any balance remaining in the treasury as aforesaid over to the accredited agent of the State of Texas.

*Resolved*, That the governor of Texas be, and he is hereby, requested to furnish each of our delegation in Congress with a copy of this resolution.

Approved February 16, 1858.

DEPARTMENT OF STATE, AUSTIN, Texas,
*February* 25, 1858.

I, the undersigned, secretary of state of the State of Texas, do certify that the transcript on the reverse hereof is a correct copy of the original joint resolution on file in the department of state.

[L. S.] Witness my hand, and the seal of the department of state, the day and year first above written.

BIRD HOLLAND,
*Acting Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 95.

# KANSAS.

# RESOLUTIONS

OF THE

# LEGISLATURE OF THE STATE OF TEXAS,

IN RESPONSE TO

*The governor's message on Kansas affairs.*

MARCH 15, 1858.—Ordered to be printed.

JOINT RESOLUTIONS in response to the governor's message on Kansas affairs.

Whereas there exists, and has existed, a violent determination on the part of a portion of the inhabitants of the Territory of Kansas to exclude by force the citizens of the slaveholding States from a just, equal, and peaceful participation in the use and enjoyment of the common property and territory of the members of the confederacy; and whereas, this determination, owing to the state of political feeling in the northern States of the confederacy operating upon the federal government, may become effectual, and the exclusion perpetual, therefore—

1. *Be it resolved by the legislature of the State of Texas*, That the governor of this State is hereby authorized to order an election for seven delegates, to meet delegates appointed by the other southern States, whenever the executives of a majority of the slaveholding States shall express the opinion that such convention is necessary, to preserve the equal rights of such States in the Union, and advise the governor of this State that measures have been taken for the appointment of delegates to meet those of Texas; and that the sum of *ten thousand dollars*, or so much thereof as is necessary, be, and the same is hereby, appropriated out of any money in the treasury not otherwise appropriated, to pay the mileage and per diem of such delegates, which shall be paid at the rate paid to members of the United States Congress according to the law in force in the year 1854.

2. That should an exigency arise, in the opinion of the governor, in which it is necessary for the State of Texas to act alone, or by a

convention representing the sovereignty of the State, he is hereby requested to call a special session of the legislature to provide for such State convention.

3. That the governor is requested to transmit copies of these resolutions to the executives of each of the slaveholding States, and to our members of Congress.

Approved February 16, 1858.

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DEPARTMENT OF STATE,
*Austin, Texas, February* 23, 1858.

I, the undersigned, secretary of state of the State of Texas, do certify that the above and foregoing is a correct copy of the original joint resolution on file in the department of state.

[L. S.] Given under my hand, and the seal of the department of state, this day and year first above written.

T. L. ANDERSON,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 96.

# PENSIONS TO THE SURVIVING SOLDIERS OF THE INDIAN WARS OF 1791 TO 1795.

## CONCURRENT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF NEW YORK,

IN FAVOR OF

*Granting pensions to the surviving soldiers of the Indian wars of* 1791 *to* 1795.

MARCH 16, 1858.—Ordered to be printed.

STATE OF NEW YORK.

EXECUTIVE DEPARTMENT.

IN SENATE, *February* 4, 1858.

*Resolved*, (if the assembly concur,) That our senators in Congress be instructed, and our representatives requested, to use their influence to procure the passage of a law granting a pension to the surviving soldiers of the Indian wars of seventeen hundred and ninety-one to seventeen hundred and ninety-five, under Generals Wayne, Harmer and St. Clair, and to the widows of the deceased soldiers of that war.

*Resolved*, (if the assembly concur,) That his excellency the governor be requested to transmit a copy of the above resolution to our senators and representatives in Congress.

Passed. By order,

S. P. ALLEN, *Clerk.*

IN ASSEMBLY, *February* 27, 1858.

Concurred in. By order,

D. WILSON, *Clerk.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 97.

# ARMS FOR MILITIA.

## CONCURRENT RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF NEW YORK,

IN RELATION TO THE

*Distribution of arms to the militia of the several States.*

MARCH 16, 1858.—Referred to the Committee on the Militia.

STATE OF NEW YORK.

IN SENATE, *March* 5, 1858.

Whereas it appears from the report of the commissary general and other officers, that the muskets furnished by the federal government to the military forces of this State are of an old pattern and unserviceable quality, and that the issue of such arms continues, notwithstanding the remonstrance of this State, and the fact that there are arms of the latest and most approved models in the United States arsenals; and

Whereas this State has with great care and attention improved her military system, and holds in readiness, to serve the republic, a large and reliable force, disciplined and equipped according to act of Congress; therefore—

*Be it resolved*, (if the assembly concur,) That our senators in Congress be instructed, and our representatives requested, to urge the passage of a law which shall grant to the militia of the States arms and equipments of the greatest efficiency, and which shall greatly increase the quantity of arms issued; and, also, the passage of a law to improve the organization and discipline of the militia of the States.

*And be it further resolved*, That the governor be requested to transmit a copy of the preamble and resolution to each of our senators and representatives in Congress.

The above resolutions were duly passed.

By order of the senate.

S. P. ALLEN, *Clerk.*

IN ASSEMBLY, *March* 8, 1858.

The above resolutions were duly passed.

By order of the assembly.

D. WILSON, *Clerk.*

---

STATE OF NEW YORK, *Secretary's Office.*

I have compared the preceding with the original concurrent resolution on file in this office, and do hereby certify that the same is a correct transcript therefrom, and of the whole of said original resolution.

Given under my hand and seal of office, at the city of Albany, this eleventh day of March, in the year one thousand eight hundred and fifty-eight. [L. S.]

S. W. MORTON,
*Dep. Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 98.

# MONUMENT TO BARON DE KALB.

## MEMORIAL

OF THE

## MARYLAND HISTORICAL SOCIETY,

IN REFERENCE TO

*A monument to the Baron De Kalb.*

MARCH 16, 1858.—Referred to the Committee on the Library.

This memorial of the Maryland Historical Society respectfully showeth, that, in the year 1780, the Congress of the Confederation passed the following resolution:

In Congress, on the 14th October, 1780, it was

*Resolved*, That a monument be erected to the memory of the late Major General the Baron De Kalb, in the city of Annapolis, in the State of Maryland, with the following inscription:

Sacred to the memory of
THE BARON DE KALB,
Knight of the Royal Order of Military Merit,
Brigadier of the armies of France,
and
Major General in the service of the United States of America.
Having served with honor and reputation for three years,
he gave a last and glorious proof of his attachment to the
liberties of mankind and the cause of America
in the action near Camden, in the State of South Carolina,
on the 16th of August, 1780;
where, leading on the troops of the Maryland and
Delaware lines against superior numbers,
and animating them by his example and deeds of valor,
He was pierced with many wounds, and,
on the 19th following, expired, in the 43d year of his age.
The Congress of the United States of America,
in gratitude to his zeal, services, and merit,
have erected this monument.

The adoption of this resolution by the members of that Congress could scarcely have been a mere expression of approbation of the gallantry of the Baron De Kalb, but carried with it, as must be sup-

posed, the higher purpose of testifying their homage to his eminent services in an enduring form. From the uniformly grave and prudent course of that distinguished body, we cannot, in justice, ascribe to it any other motive than one in strict consonance with its wise deliberations and consistent policy. The just inference must therefore be, that the omission to execute the resolution arose from the momentous exigencies of the public service, both in their time and their pecuniary resources. With the fate of the republic claiming their severe and unceasing attention, whether in diplomatic negotiations, in levying and equipping armies, in assuaging jealousies of individuals or communities, and the still more difficult task of obtaining money, it may be well imagined why inferior matters gave place to others of so much greater magnitude.

So, after the adoption of the constitution of 1787, the whole mind of the statesmen of that day was directed to putting the new machinery into motion, to assuming our right position in the family of nations, and to the organization of such a system of finance as would provide for the public debt and all the wants of government. These, with other causes of no less import and weight occurring at various epochs, may fairly be cited as reasons for the neglect of the resolution up to the present time.

Now, however, all these impediments to its execution have ceased, and it would seem that no more appropriate period than the present can be found for discharging this long-neglected but no less sacred duty. The public sentiment has of late been much devoted to the rearing of monuments and statues to departed worthies and patriots. States and individuals are now taking pride in thus erecting and handing down to future times memorials of the generous sacrifices and patriotic deeds of those statesmen and heroes who wrought out our independence and established our liberties.

Your memorialists feel the greater confidence in the success of their application when it is borne in mind that, in fulfilling the design of the resolution of 1780, a testimonial to the signal and devoted courage of De Kalb is not alone transmitted to posterity, but that also of the American forces under his command, who sealed their unsurpassed heroism in one of the hardest fought battles on record.

With these considerations, and with the knowledge that the resources of the country are of undoubted abundance, your memorialists would most earnestly, yet respectfully, pray that the patriotic resolution of 1780, directing the erection of a monument "in gratitude to the zeal, services, and merit" of the Baron De Kalb may be now executed.

And your memorialists will ever pray, &c.

J. SPEAR SMITH,
*President.*

S. F. STREETER,
*Recording Secretary.*

E. A. DALRYMPLE,
*Corresponding Secretary.*

BALTIMORE, *March* 11, 1858.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 99.

# ENDOWMENT OF AGRICULTURAL COLLEGES.

## RESOLUTIONS

OF THE

## STATE AGRICULTURAL SOCIETY OF NEW YORK,

FOR

*The distribution of a portion of the public lands to the States and Territories, for the benefit of agricultural colleges therein.*

MARCH 16, 1858.—Referred to the Committee on Public Lands.

AGRICULTURAL ROOMS,
*Albany, February* 10, 1858.

ANNUAL MEETING.

The following preamble and resolutions were presented, and unanimously adopted:

On motion of Mr. E. C. DIBBLE, seconded by L. F. ALLEN,

Whereas the public lands of the United States are the common property of the whole Union, and in their distribution should be applied for the general good of the whole; and as it has been the established policy of the government to set apart a portion of the public lands for the purposes of education, and believing that no disposition of the lands can be made which will more completely promote the prosperity of our whole country, than by the appropriation of portions of the same for the establishment of a system of agricultural colleges in the several States and Territories and in the District of Columbia, for the education of the industrial classes: Therefore,

*Resolved*, That the Senate and House of Representatives be requested to grant, during the present session of Congress, to the several States and Territories and to the District of Columbia, a sufficient quantity of the public lands to endow and maintain agricultural colleges in each State and Territory and in the District of Columbia; and that we approve of the main features of the bill introduced into Congress by the Honorable Mr. Morrill, as well calculated to carry out the objects contemplated.

*Resolved*, That the secretary be directed to furnish each member

of the Senate and House of Representatives with a copy of the above resolution.

In pursuance of the resolution above adopted, I forward you the preceding preamble and resolutions, respectfully asking your attention to the same.

Very respectfully, yours,

B. P. JOHNSON,
*Corresponding Secretary.*

Hon. JOHN COCHRANE.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 100.

# UTAH.

## MEMORIAL

OF THE

## MEMBERS AND OFFICERS OF THE LEGISLATIVE ASSEMBLY OF THE TERRITORY OF UTAH,

SETTING FORTH

*Their grievances, and praying Congress to give them a voice in the selection of their rulers.*

MARCH 16, 1858.—Laid before the House and read.
MARCH 17, 1858.—Laid on the table and ordered to be printed.

MEMORIAL from the members and officers of the legislative assembly of the Territory of Utah to the President and Congress of the United States.

GENTLEMEN: Your memorialists beg leave to represent that, at the last session of the legislative assembly of this Territory, resolutions and a memorial to the President of the United States were adopted and presented to him, which partially set forth our grievances and made known to the government at Washington our desires and wishes in regard to the appointment of the federal officers for Utah. We have received no response to those documents, unless it is to be understood that the appointment of a full set of officers for this Territory, backed by an army to enforce them upon us, as reported by common rumor to have been ordered and fitted out, and sent to this Territory by the President, is to be deemed an answer. Certain it is that such an army is now invading our Territory, claiming to have been sent by the authority of the President of the United States.

We now forward to you respectfully, to wit: the President and Houses of Congress, a printed copy of those resolutions and memorial, and if it is true that the army now menacing this Territory is at the instance of the President, and by the authority of the government, we request to be informed of the fact, and why it is so; for what reasons our resolutions and memorial are treated with silent contempt, and a hostile course pursued towards an unoffending people? Why it is that our eastern mails have been stopped, and the communication between this Territory and the general government cut off?

If officers had been appointed and sent in accordance with the voice of the people, as ever should be the only course in a republican government, there would have been no need of an army's being sent here.

less, who alone feel the need of the backing afforded by bayonets, and, for this reason, had far better remain where society is more congenial to their depraved and corrupt tastes. No doubt such is the character of the present appointees—for what other class would accept offices among a people where they well knew they were not wanted, and hence had no right, officially, to be? All we have further to say of them is, they had better tarry with their friends, if they really have any.

We claim that we should have the privilege, as we have the constitutional right, to choose our own rulers and make our own laws without let or hindrance. Examine our reports, our laws, our acts; they have ever been before the public; they speak for themselves.

All we want is the truth, and fair play. The administration have been imposed upon by false and designing men; their acts have been precipate and hasty, perhaps through lack of due consideration. Please to let us know what you want of us before you prepare your halters to hang, or "apply the knife to cut out the loathsome and disgusting ulcer." Do you wish us to deny our God and renounce our religion? That we shall not do. We are at the defiance of earth and hell to prove that we have done aught to offend the *good*.

You have not extended to Utah so much as the customary usages of investigation, which would have placed in your possession the facts in the case. Do you wish us to permit a hireling soldiery to come into our settlements? If so, for what object? Is it to protect the citizens in their rights? That is needless, because those rights have never been, in the least, infringed upon in Utah; and we are far better prepared to protect ourselves than when we first settled in this Territory, while our young and healthy men were in the United States army in Mexico. United States troops, acting in their legitimate capacity, are only sent to protect the citizens or suppress insurrection, and never, in any case, to make war upon the people.

We feel as competent to protect ourselves as we have hitherto; and there is no insurrection to quell. That "white heap" within our borders contains something besides meal; there are the deadly fangs to hold the innocent prisoners still while assassins kill them. We shall not again hold still while fetters are being forged to bind us. We have no confidence to believe the present a harmless demonstration, intended for our good. The troops, which claim to have been sent by the government, have openly said, from the time they left the Missouri river, and even before, that they were coming to destroy the leaders of our people, and that that was their object. That has been their constant speech by day and the burden of their songs by night. They have threatened to take our lives and to sport, at pleasure, with our wives and daughters. That is their openly avowed object; but woe to all who attempt to accomplish it. We trust, therefore, that you will excuse us if we do not entertain a very exalted idea of your humane (?) intentions in sending armies hither.

Give us our constitutional rights; they are all we ask, and them we have a right to expect. For them we contend, and feel alone justified in so doing.

We are aware that we have many enemies, and that they make a

strong party against us. From them we expect no mercy. A large portion of them know that if justice had its due they would either be pulling hemp by the neck or learning a trade in the confines of a prison. They roam at large in your community; are boon companions in your halls of business and of pleasure; adorn your circles of fashion, and participate in your festivities. But there is a chord of right—of honesty—integrity to the institutions of our country—of love of freedom and a respect for the rights of the weak and comparatively defenceless—that will yet thrill with emotion, vibrate through the honest heart, and respond to the cry of usurpation, tyranny and oppression exercised upon an innocent people. To that we appeal, and trust that a stern sense of justice yet remaining among the worthy sons of patriotic sires will stay the suicidal hand of crawling sycophants and corrupt rulers, and that American liberty may not be immolated upon her own altars, nor strangled in the halls of her own citadel by those whose sworn duty it is to be her protectors.

Withdraw your troops; give us our *constitutional rights*, and we are at home.

Heber C. Kimball, *Pres't Council.*
Daniel H. Wells,
Albert Carrington,
F. D. Richards,
Lorenzo Snow,
Wilford Woodruff,
Lorin Farr,
Benjamin F. Johnson,
Leonard E. Harrington,
Joseph Holbrook,
Warren S. Snow,
Louis Brunson,
George A. Smith,
John Taylor, *Speaker H. R.*
W. W. Phelps,
A. P. Rockwood,
J. C. Little,
Daniel Spencer,
Alexander McRea,
Orson Hyde,
J. W. Cummings,
Hosea Stout,
Jos. A. Young,
H. B. Clawson,
John Rowberry,
J. D. Parker,
Reddick N. Allred,
Chauncey M. West,
Aaron Johnson,
James C. Snow,
Preston Thomas,
J. G. Bigler,
George Peacock,
Philo T. Farnsworth,
J. C. Haight,
John H. Lee,
Isaac Bullock,
Leo. Hawkins, *Sec'y of Council.*
John T. Caine, *Assistant do.*
George D. Grant, *Serg't-at-arms.*
Samuel L. Sprague, *Messenger.*
John Sharp, *Foreman.*
C. H. Wheeler, *Chaplain.*
James Ferguson, *Ch. Clk. H. R.*
Patrick Lynch, *Assistant do.*
Wm. H. Kimball, *Serg't-at-arms.*
N. B. Young, jr., *Messenger.*
William Derr, *Foreman.*
Jesse Haven, *Chaplain.*
Wm. H. Hooper,
*Sec'y pro. tem. U. T.*

GREAT SALT LAKE CITY, UTAH TERRITORY, *January* 6, 1858.

# ARIZONA TERRITORY.

## LETTER

FROM THE

## GOVERNOR OF THE TERRITORY OF NEW MEXICO,

TRANSMITTING

*esolutions of the legislative assembly in relation to the Arizona Territory.*

MARCH 19, 1858.—Referred to the Committee on Territories.

EXECUTIVE DEPARTMENT,
*Santa Fé, February* 12, 1858.

SIR: By request of the legislative assembly of the Territory of ew Mexico, I herewith transmit to you sundry resolutions adopted r that body, and request that you will present them to the House of epresentatives.

With great respect, your obedient servant,

A. RENCHER,
*Governor.*

Hon. The SPEAKER *of the House of Reps., Washington.*

JOINT RESOLUTION.

*Resolved by the council and house of representatives of the legisla- e assembly of the Territory of New Mexico,* That we concur in the ews of his excellency the President of the United States, as ex- essed in his recent annual message to Congress, relative to the ganization of the Territory of Arizona, but we most respectfully bmit that the boundaries of said Territory should be as follows: Beginning at the point upon the Rio Colorado of the West where the ndary lines of the United States and Mexico meet, running thence the east along the said line to the one hundred and ninth parallel longitude west from Greenwich, thence north with the said parallel longitude to the northern boundary line of New Mexico, thence

west with the said boundary line to the eastern boundary of the State of California, and thence south with the said eastern boundary of California to the commencement.

*Resolved, further*, That the government of the United States be, and is hereby, memorialized and petitioned to cause all of the wild Indians within the limits of the Territory of New Mexico to be removed to and collocated in that part of the Territory of Arizona as lies north of the thirty-fourth parallel of northern latitude.

*Resolved, further*, That our delegate in Congress be, and he is hereby, instructed to use his best exertions to carry out the purposes of these resolutions.

*And be it further resolved*, That his excellency the governor be, and he is hereby, respectfully requested to transmit one copy of these resolutions to our delegate in Congress, one copy to the President of the Senate, and one to the Speaker of the House of Representatives of the United States.

DONACIANO VIGIL,
*President of the Council.*
M. ASHURST,
*Speaker of the House of Representatives.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 102.

# WISCONSIN—AMOUNT DUE FROM SALES OF PUBLIC LANDS.

## MEMORIAL

OF THE

## LEGISLATURE OF THE STATE OF WISCONSIN,

IN REFERENCE TO

*The amount due that State from the sale of public lands lying within her borders.*

MARCH 25, 1858.—Referred to the Committee on Public Lands.

MEMORIAL to Congress for amount due from sale of public lands lying within this State.

This memorial respectfully represents that, according to act of Congress, and by virtue of a provision in the constitution of Wisconsin, this State is entitled to five per centum of the net proceeds arising from the sale of public lands lying within the same; and that there is now due the State from the general government about the sum of three hundred thousand dollars arising from that source—the amount due having been refused on the application of persons authorized to receive it. Your memorialists respectfully ask your honorable body to adopt such course or enact such laws as will secure to this State the amount due her from the sales of public lands, as herein set forth.

The governor of this State is hereby requested to transmit a copy of this memorial to the President of the United States, and to each of our senators and representatives in Congress.

F. S. LOVELL,
*Speaker of the Assembly.*
E. D. CAMPBELL,
*Lieutenant Governor and President of the Senate.*

Approved March 12, 1858.

ALEX. W. RANDALL.

STATE OF WISCONSIN, } ss.
*Secretary's Office,*

The secretary of state of the State of Wisconsin does hereby certify that the foregoing memorial has been compared with the original memorial on file in this office, and that the same is a true and correct copy thereof, and of the whole of such original.

In witness whereof, I have hereunto set my hand and affixed the great seal of the State, at the capitol, in Madison, this thirteenth day of March, A. D. 1858.

[L. S.]

D. W. JONES,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 103.

# KANSAS.

## RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF NEW YORK,

IN OPPOSITION TO

*The admission of Kansas into the Union with the Lecompton constitution.*

MARCH 25, 1858.—Ordered to be printed.

IN ASSEMBLY, *March* 6, 1858.

*Resolved* (if the assembly concur), That the State of New York is opposed to the admission of Kansas into the Union as a State, with the constitution commonly known as the Lecompton constitution, or any other constitution which shall not have been in all its parts fairly submitted to the legal voters of the Territory, and received their sanction and approval.

*Resolved*, That a copy of this resolution be transmitted to the senators and members of the House of Representatives from this State in Congress.

Passed assembly.
By order:

DAVID WILSON, *Clerk.*

IN SENATE, *March* 19, 1858.

Passed senate.
By order:

S. P. ALLEN, *Clerk.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 104.

# KANSAS AFFAIRS.

# RESOLUTIONS

OF

# THE LEGISLATURE OF THE STATE OF MAINE,

PROTESTING

*Against the admission of Kansas into the Union under the Lecompton Constitution.*

MARCH 26, 1858.—Ordered to be printed.

STATE OF MAINE.

RESOLVES relative to Kansas affairs.

Whereas the national administration is attempting to force upon the people of Kansas a constitution of government framed without their authority, and repugnant to their wishes: Therefore—

*Resolved*, That the legislature and people of Maine, moved by a profound sense of duty, hereby solemnly protest against the contemplated measure as dangerous to liberty, violative of the rights of the people of Kansas, and subversive of the principles upon which our government rests.

*Resolved*, That a copy of these resolves be forwarded to our senators and representatives in Congress.

IN THE HOUSE OF REPRESENTATIVES, *March* 16, 1858.

Read and passed.

JOSIAH H. DRUMMOND, *Speaker*.

IN SENATE, *March* 17, 1858.

Read and passed.

SETH SCAMMAN, *President*.

MARCH 18, 1858.

Approved.

LOT M. MORRILL.

OFFICE OF SECRETARY OF STATE,
*Augusta, March* 22, 1858.

I hereby certify that the foregoing is a true copy of the original deposited in this office.

LEWIS D. MOORE,
*Dep. Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 105.

# NORTHERN AND PACIFIC RAILROAD.

## LETTER

FROM THE

## SECRETARY OF THE TERRITORY OF WASHINGTON,

COMMUNICATING

*Resolutions of that Territory relative to the construction of a Northern Pacific railroad.*

MARCH 27, 1858.—Referred to the Select Committee on the Pacific Railroad.

RESOLUTIONS relative to the construction of a national railroad across the continent from the Atlantic States to the Pacific ocean.

*Resolved*, That, in the opinion of the legislative assembly of the Territory of Washington, the time has arrived for the construction of a great national railway across our continent, connecting the populous States of the Atlantic with the Pacific shores of the Union, already colonized with our young and vigorous men; that so great an object never yet has been presented to the acceptance of a nation; that the great importance of this line of communication is incalculable.

*Resolved*, As the opinion of the legislative assembly, that there are many and very important reasons requiring the construction of this great work. It will bind together this vast republic, and be a chain of union between the Atlantic and Pacific States. It will insure the defence of the country. Armies, seamen, military and naval stores may be transported from ocean to ocean in less time and with less expense than were required between New York and the lakes during the war of 1812. It will give a direct, quick transit to mails. Military reasons call for its construction; political reasons require that it should be made; and, more than all, commercial reasons demand it. The trade of the Pacific ocean and Eastern Asia will take its track. The trade of India, whose channels have been shifting for hundreds of years, is destined to shift once more, and that is, across our continent. The American road to India will become the European track to that region, and the rich commerce of Asia will flow through our centre.

# INCREASED MAIL FACILITIES.

## RESOLVES

OF THE

## EGISLATURE OF THE STATE OF IOWA,

ASKING

*For increased mail facilities in that State.*

MARCH 27, 1858.—Referred to the Committee on Post Offices and Post Roads.

JOINT RESOLUTION for increased mail facilities.

*Resolved by the general assembly of the State of Iowa*, That our nators in Congress be instructed, and our representatives be reiested to use their influence in procuring additional mail facilities this State, as follows:

1st. From Tipton, in Cedar county, to Rome, Madison, and the ntre of Jones county, and thence to Cascade, in Dubuque county; the ail to be carried over said route three times per week.

2d. From Muscatine, to Oscaloosa, *via* Ononna, Columbus City, mboy, Washington, and Sigourney, so as to give a daily mail.

4th. From Oscaloosa, to Council Bluffs, *via* Knoxville, Indianola, d Wintersett; the mail to be carried daily.

5th. Independence by Fairbank, in Buchanan county, Frarklin, remer, and Leroy, in Bremer county, to Fredericksburg, in Chickaw county; the mail to be carried weekly.

6th. From Mount Pleasant, in Henry county, *via* Wayne, in said unty, Crawfordville, Amboy, Davis creek, and Yatton, in Washgton county, and Seventy-eight, in Johns county, to Iowa City; the ail to be carried tri weekly.

7th. From Ceder Falls, in Blackhawk county, *via* Willoughby, ranton, and Bear Grove, in Butler county, and Genea, in Franklin unty, to Maysville, also in Franklin county.

8th. From Iowa Fall, in Hardin county, *via* Maysville, Hampton, d Saratoga, in Franklin county, to Mason city, in Cerro Cordo unty.

9th. From Dakotah, in Humbold county, *via* the S. ½ Sec. 18, T. , R. 30, and Paoli, in Palo Alto county, to Spirit lake, in Dickina county; the mail to be carried weekly.

10th. From Wintersett, in Madison county, *via* Fontenelle, Adair county, Lewis, in Cass county; the mail to be carried tri-weekly.

11th. From Iowaville, *via* Troy, Stringtown, and Milton, to Memphis, Missouri; the mail to be carried weekly.

12th. From Wiscotta, Dallas county, *via* Bolds, in the northeast corner of Adair county, Holliday's Settlement, and Clarksville, to Fontenelle, in said county; the mail to be carried weekly.

13th. From Eddyville, to Des Moines, *via* Hamilton, Marysville, Attica, Knoxville, Pleasantville, Wheeling, Hartford, Carlisle, and Avon; the mail to be carried daily.

15th. From Newton, Jasper county, to Nevada, Stora county, *via* the State road, and for the establishment of a post office at Clyde City, and another near Salem Jeffries.

*Resolved*, That the secretary of state be instructed to forward a copy of the foregoing resolutions to each of our senators and representatives in Congress.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved March 16, 1858.

RALPH P. LOWE.

I hereby certify that the foregoing is a true copy of the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 107.

# ENTRIES WITH LAND WARRANTS AND CASH.

## RESOLUTIONS

OF

## THE LEGISLATURE OF THE STATE OF IOWA,

ASKING THAT

*Certain land entries, made with warrants and cash, may be confirmed.*

MARCH 27, 1858.—Referred to the Committee on Public Lands.

A MEMORIAL to Congress to confirm and legalize certain locations made with land warrants.

Whereas a practice existed in several of the United States land offices in this State, in cases of conflicting applications for the same tract of land, of permitting the highest bidder for the same to locate a land warrant on the tract, at the rate of one dollar and twenty-five cents per acre, and to pay the excess in price over that rate in money;

And whereas the Commissioner of the General Land Office has decided that all such locations made with land warrants issued under the act of March 3, 1855, are illegal, and will be vacated;

And whereas that decision will work a great hardship and loss to the parties who made such locations: Therefore, be it

*Resolved by the general assembly of the State of Iowa*, That our senators be instructed, and our representatives in Congress be requested, to procure the passage of a law confirming the title to all locations made with land warrants issued under the act of March 3, 1855, on which a higher price than one dollar and twenty-five cents was paid, provided said locations were legal in other respects.

*Resolved*, That the secretary of state be required to forward a copy of the above memorial and resolution to each of our senators and members of Congress, and also to the Commissioner of the General Land Office.

STEPHEN B. SHELLEDY,
*Speaker of the House of Representatives.*
ORAN FAVILLE,
*President of the Senate.*

Approved March 15, 1858.

RALPH P. LOWE.

I hereby certify that the foregoing is a true copy from the original roll on file in my office.

ELIJAH SELLS,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 108.

# CAUSES OF DEFICIENCY IN THE REVENUE OF THE POST OFFICE DEPARTMENT.

## LETTER

FROM

## THE POSTMASTER GENERAL,

IN EXPLANATION OF

*The causes of the deficiency in the revenue of the Post Office Department.*

MARCH 29, 1858.—Referred to the Committee of Ways and Means.

POST OFFICE DEPARTMENT,
*March* 24, 1858.

SIR: I regret that the incessant pressure of my engagements should have occasioned so great delay in responding to your communication of the 11th ultimo, propounding, on behalf of the committee, certain inquiries as to the cause or causes of the deficiency in the revenue of this department for the fiscal year ending June 30, 1858. It may be affirmed, in general terms, that the deficiencies in this as well as preceding years were produced, in part, by the acts of Congress reducing the rates of postage, and thereby diminishing the revenue; and partly by other acts increasing the annual expenditures by enlarging the scale of commissions allowed to postmasters, by establishing a great number of post routes annually, and by requiring the mails to be carried on all railroads as soon as completed. But as the honorable committee desire the causes to be stated more in detail, I will first refer, briefly, to the effect upon the revenue produced by the acts reducing the rates of postage.

The act of March 3, 1845, changed the rates of postage from 6, 10, 12½, 18¾, and 25 cents, for single letters, to 5 and 10 cents, according to distance, and required accounts, payable out of the treasury, to be kept against Congress and the executive departments for free matter passing in the mails. This act went into operation July 1, 1845; and, excluding the sums received from the treasury for free matter—amounting to about $231,000—the revenue from postages fell short of the year preceding $1,056,156.

| | |
|---|---|
| Postage revenue, year ending June 30, 1845, the last year of the old rates | $4,268,996 |
| Postage revenue, year ending June 30, 1846, the first year of the new rates | 3,212,840 |
| Loss first year | 1,056,156 |

But, as had been anticipated, this immediate depression of the revenue was soon followed by a rapid increase, which continued up to the year ending June 30, 1851, when it reached the sum of $6,355,049, exceeding by $2,086,053 the revenue of the year 1845, and producing $331,483 more than the regular expenditures of 1851, which had gone up to $6,024,566.

The revenue from postages and the expenditures in 1845 and 1851 are compared below:

Revenue in 1845 from postages, exclusively, $4,268,996; expenditures same year, excluding foreign postages, $4,320,732. Revenue in 1851 from postages, exclusively, $6,355,049; expenditures same year, excluding foreign postages, $6,024,566. Excess of expenditure in 1845, $51,736. Excess of revenue in 1851, $331,483.

The second "Act to reduce and modify the rates of postage" was approved March 3, 1851, and went into operation July 1, 1851. By this act the postage on single letters was reduced from five and ten cents, according to distance, under or over 400 miles, to three cents, if prepaid, and five cents, if unpaid, for distances under 3,000 miles; and double those rates if sent over 3,000 miles. This act, as stated by Mr. Hubbard, late Postmaster General, in his annual report, dated December 4, 1852, occasioned a reduction of revenue amounting to $1,431,696 for the first fiscal year ending June 30, 1852. He remarks that this loss of revenue "is attributable to the reduction in the rates of postage made by the act of March 3, 1851;" and he adds that "this diminution is somewhat greater than was anticipated in this department at the time the act went into effect, and much greater than was expected by the sanguine advocates of cheap postage, many of whom sought the establishment of still lower rates."

The act of March 3, 1855, fixed the present rates of three cents for distances under 3,000 miles, and ten cents for letters carried over that distance, and required all inland letters to be prepaid except privileged correspondence. This act does not appear to have either increased or diminished the revenue to any important amount.

Having noticed the acts of 1845, 1851, and 1855, mainly with respect to their effect upon the revenue derived from letter postage, I proceed to show to what extent it has been diminished by changes in the rates of postage on newspapers, pamphlets, and other printed matter. The act of 1845 did not materially affect the revenue from this source, which, with the exception of the year 1847, continued steadily to increase up to the 30th June, 1851, when it reached the sum of $1,035,130 for that year. But while the act of March 3, 1851, greatly reduced the rates established by the act of 1845, upon publications issued to regular subscribers, it increased the charges upon transient

matter, and the result, nevertheless, was a loss of revenue the first year of $245,884.

Charging postage on newspapers, &c., by a scale of distances was found exceedingly inconvenient, and this was remedied by the act of August 30, 1852, which went into operation on the 1st October following; but this remedial act went further, and made a still greater reduction of postage, especially on printed matter issued to regular subscribers, by allowing them a discount of 50 per cent. for payment in advance, when such postage was already required by the act of 1825 to be paid in advance *without discount*. By this provision of the act of 1852 one-half of the postage is remitted to the subscriber, the postmaster takes his legal commission of one-half of the remainder, and the government gets the residue, or one-fourth of the nominal rates fixed by the statute. No important change has been made in the rates of postage on printed matter since 1852, and the following statement will show the revenue from such matter since 1851, the year in which the act of 1845 ceased to operate:

| | |
|---|---|
| Revenue from newspapers, &c., 1851 | $1,035,130 |
| Revenue from newspapers, &c., 1852 | 789,246 |
| Revenue from newspapers, &c., 1853 | 611,333 |
| Revenue from newspapers, &c., 1854 | 606,148 |
| Revenue from newspapers, &c., 1855 | 638,927 |
| Revenue from newspapers, &c., 1856 | 632,745 |
| Revenue from newspapers, &c., 1857 | 634,863 |

For the last five years the revenue from printed matter has been nearly stationary.

The general effect produced upon the revenue by the postal laws of 1845, 1851, 1852, and 1855, is thus exhibited:

| | |
|---|---|
| The revenue *from postages* for the year 1845, the last year of the old rates, was | $4,268,996 |
| For the year 1851, the last year of the five and ten cent rates, excluding foreign postages, it was | 6,355,049 |
| And for the year 1857, foreign postages, registered letters, earnings of letter carriers, &c., excluded, it was | 6,987,362 |

Thus the revenue of 1851 exceeded that of 1845 by $2,086,053, or $48\frac{86}{100}$ per cent., while that of 1857 exceeded 1851 only $632,313, or $9\frac{94}{100}$ per cent. The average annual increase for the six years ending June 30, 1851, under the five and ten cent rates, was $8\frac{14}{100}$ per cent., while the increase under the reduced rates since established was only $1\frac{66}{100}$ per cent.

But in order to estimate the probable amount of deficiency in the revenue for the year 1858, which may be ascribed to the acts of March 3, 1851, August 30, 1852, and March 3, 1855, suppose the act of March 3, 1845, establishing the five and ten cent rates for letters, had remained unchanged, except so far as to remedy the inconvenience of charging printed matter by distance; and suppose, further, that the revenue continued to increase from 1851 to 1858 at the rate of 5 per cent. annually, instead of 8, as it did from 1845 to 1851, then the gross revenue of 1858, exclusive of foreign postages and the earnings of letter carriers, would amount to $8,942,192; but

the estimated gross revenue of the year, excluding the items tioned, is set down at $7,330,188,—thus showing an estimated l revenue in the year 1858 amounting to $1,612,002, which, thought, may be fairly attributed to the operation of those acts.

Having thus shown to what extent deficiencies in the reven this department are supposed to have been produced by the tion of postages and the consequent diminution of income, now endeavor to show, in part, how those deficiencies have bee mented by an increase of expenditure.

The cost of transporting the mails appears to have increase greater degree since 1845 than any other branch of the postal s A vast extent of new territory has been brought within our org system of post roads, and however important the new mail established in such territory may become in the future, they expected to yield a return in revenue only as population adv The department, nevertheless, is necessarily called upon to ta initiative, and the post road and the post office are made to p the land office in the general scheme of development. The pr labor and of stock and provender have greatly advanced in every section of the country, and the department has therefor compelled to pay much higher rates in making its contracts. country advanced in population, higher grades of service b necessary, more frequent trips were demanded, and many oth provements were required, to give circulation and speed to the

Embraced under the general head of "Transportation mails" is the cost of all the service performed by railroads, however desirable for regularity, speed, and efficiency, is y more expensive than the modes of service superseded by it. B the cost of the service on railroads, the incidental expenses department for route agents, local agents, and mail messeng take charge of the mails upon them, and to supply offices on th amount to a very considerable sum annually.

The comparative table below exhibits the cost of "mail trans tion," inland and foreign, as it existed on the 30th day of Ju the years 1845, 1851, and 1857:

| | 1845. | 1851. | |
|---|---|---|---|
| Length of post roads, miles | 143,940 | 196,290 | |
| Contract cost of inland transportation, dollars | 2,905,504 | 3,567,651 | 7, |
| Length of railroads, miles | 4,092 | 8,255 | |
| Contract cost of railroad service, dollars | 562,141 | 985,019 | 2, |
| Local agents, route agents, and mail messengers, dollars | 37,513 | 145,897 | |
| Length of steamboat routes, miles | 7,625 | 13,973 | |
| Contract cost of steamboat service, dollars | 279,307 | 454,892 | |
| Foreign mails paid for by the Post Office Department, viz: New York to Bremen, New York to Havre, Charleston to Havana, and Isthmus mails, dollars | None | 448,937 | |

In the foregoing statement the railroad and steamboat service, and the local and route agents and mail messengers, are all included in the sums above stated for "inland transportation." The "foreign mails" are not embraced in those sums.

| | |
|---|---|
| Total contract cost of transportation, *inland* and *foreign*, in 1845 | $2,905,504 |
| Same, in 1851 | 4,016,588 |
| Same, in 1857 | 7,650,828 |

Increase, 1845 to 1851, $38\frac{24}{100}$ per cent.
Increase, 1851 to 1857, $90\frac{48}{100}$ per cent.

Various attempts have been made, as I am informed, to ascertain the post roads which do not pay expenses, without having arrived at any satisfactory result. When the whole vast network of mail routes produces revenue enough to defray the expenses of the establishment, the question is only of importance as one of economy; but when the revenue falls short, to determine which of the many thousand meshes are unproductive, and to what extent, are questions which have been found of very difficult solution. By way of illustration, take the route between Philadelphia and Baltimore. It is easy to ascertain the amount of postage collected at the offices on the line of the road and at the termini, but most of the way offices have supplies from other routes, and the terminal offices themselves have extensive mail connexions in every direction. It is possible to bring these operations into the form of an account with each post route in connexion with the main line, but the vast bulk of the matter daily passing over the road, east and west, is never opened on the route, and therefore no account could be taken of it without such stoppage and delay as would throw the mail system into utter confusion and render it valueless. Going east, the mail consists of matter for Pennsylvania, New Jersey, New York, the New England States, Canada, Nova Scotia, New Brunswick, and all parts of the world reached by our foreign mails through England, France, and Germany. Going toward Baltimore, the mail car contains matter for the great west and the far south. As I before stated, the bags for places beyond the terminal points are never opened between the place of despatch and the destination, and, of course, their value in postage is never ascertained with respect to an intermediate route, nor is it believed to be practicable to do it. Boston bags, direct to St. Louis or New Orleans, and the matter in its transit to either place, pass over a great number of separate routes, all linked together in one connexion.

But the department, although it cannot easily reduce the earnings of a given route to the precision of an account, does, according to a rule long observed, estimate what is termed the proceeds of a mail route when it has occasion to ascertain whether the business upon it entitles it to a higher grade of service; and following that rule, I give

below a statement of a few routes which may be regarded as unprofitable:

| | Cost per annum. | Estimated revenue. | Deficiency. |
|---|---|---|---|
| *Land routes.* | | | |
| Independence to Salt Lake city | $32,000 | $260 | $31,740 |
| Salt Lake city to San Pedro | 30,000 | 1,249 | 28,751 |
| San Antonio to San Diego | 149,800 | 1,991 | 147,809 |
| El Paso to Santa Fé | 23,386 | 733 | 22,653 |
| Loss on four land routes | | | 230,953 |
| *Steamboat routes.* | | | |
| Jefferson city to St. Joseph | 85,000 | 13,325 | 71,675 |
| New Orleans to Key West | 70,000 | 2,333 | 67,667 |
| New Orleans to Cairo | 329,000 | 43,690 | 285,310 |
| Loss on three steamboat routes | | | 424,652 |
| *Railroad routes.* | | | |
| Kingsville, S. C., to Wilmington, N. C. | 42,750 | 1,716 | 41,034 |
| Terre Haute to St. Louis | 19,550 | 5,754 | 13,796 |
| Loss on two railroad routes | | | 54,830 |
| Aggregate loss on *nine* routes | | | 710,435 |

In the foregoing statement it is believed that the full amount earned by each route is awarded to it. Kingsville to Wilmington is a link in the great through or trunk line from Boston to New Orleans, and is a striking instance of a class of routes which produce little themselves, but are necessary to render others productive.

The whole number of post routes in the United States on the 30th June, 1857, was 7,888; and as an endeavor to ascertain the unprofitable ones could not be brought to any reliable result in time for the purposes of your committee, I append a tabular statement showing the gross revenue in each State and Territory; the compensation of postmasters, and the incidental expenses paid by them; the net revenue in each State and Territory; the cost of transportation in each, and the *apparent* surplus or deficit in each. It is difficult to construct a table of this kind which shall, in mere figures, truly represent the facts. New York, for instance, shows a surplus of $433,533; but New York is not charged with the cost of the several sea-going lines from her port. If she were, she would show a large deficit than any other State. Louisiana shows a deficit of $523,515 but Louisiana is charged with the steamboat route from New Orleans

to Cairo, costing $329,000 a year. Many other instances might be cited to show the cause of deficiencies in particular States, but it is not deemed necessary.

I have the honor to be, most respectfully, your obedient servant,

AARON V. BROWN,
*Postmaster General.*

Hon. J. GLANCY JONES,
*Chairman Committee of Ways and Means,*
*House of Representatives.*

*Statement showing the gross revenue in each State and Territory, &c.*

| States and Territories. | Gross revenue from postages and stamps sold. | Compensation of postmasters and incidental expenses. | Net revenue accrued. | Cost of transporting the mails in each State and Territory. | Surplus after paying the cost of transportation. | Deficit after paying the cost of transportation. |
|---|---|---|---|---|---|---|
| Maine | $154,566 00 | $87,884 00 | $66,682 00 | $98,275 00 | | $31,593 00 |
| New Hampshire | 102,658 00 | 55,135 00 | 47,523 00 | 47,555 00 | | 32 00 |
| Vermont | 100,744 00 | 54,831 00 | 45,913 00 | 65,229 00 | | 19,316 00 |
| Massachusetts | 579,947 00 | 246,596 00 | 333,351 00 | 154,701 00 | $178,650 00 | |
| Rhode Island | 64,077 00 | 26,457 00 | 37,620 00 | 14,523 00 | 23,097 00 | |
| Connecticut | 212,492 00 | 96,144 00 | 116,348 00 | 88,572 00 | 27,776 00 | |
| New York | 1,503,444 00 | 600,779 00 | 902,665 00 | 469,132 00 | 433,533 00 | |
| New Jersey | 117,904 00 | 57,214 00 | 60,690 00 | 93,857 00 | | 33,167 00 |
| Pennsylvania | 629,155 00 | 270,125 00 | 359,030 00 | 331,379 00 | 27,651 00 | |
| Delaware | 20,380 00 | 9,867 00 | 10,513 00 | 17,166 00 | | 6,653 00 |
| Maryland | 173,192 00 | 63,742 00 | 109,450 00 | 209,319 00 | | 99,869 00 |
| District of Columbia | 44,699 00 | 38,622 00 | 6,077 00 | | 6,077 00 | |
| Virginia | 231,532 00 | 121,193 00 | 110,339 00 | 309,893 00 | | 199,554 00 |
| North Carolina | 75,329 00 | 41,402 00 | 33,927 00 | 195,507 00 | | 161,580 00 |
| South Carolina | 95,504 00 | 38,799 00 | 56,705 00 | 230,054 00 | | 173,349 00 |
| Georgia | 153,859 00 | 79,285 00 | 74,574 00 | 259,121 00 | | 184,547 00 |
| Florida | 20,899 00 | 10,985 00 | 9,914 00 | 73,771 00 | | 63,857 00 |
| Alabama | 115,397 00 | 55,334 00 | 60,063 00 | 249,276 00 | | 189,213 00 |
| Mississippi | 84,678 00 | 44,683 00 | 39,995 00 | 220,335 00 | | 180,340 00 |
| Texas | 77,517 00 | 39,439 00 | 38,078 00 | 229,631 00 | | 191,553 00 |
| Kentucky | 136,943 00 | 67,092 00 | 69,851 00 | 144,283 00 | | 74,432 00 |
| Michigan | 167,935 00 | 89,654 00 | 78,281 00 | 140,408 00 | | 62,127 00 |
| Wisconsin | 180,429 00 | 85,600 00 | 94,829 00 | 105,820 00 | | 10,991 00 |
| Louisiana | 154,505 00 | 56,603 00 | 97,902 00 | 621,417 00 | | 523,515 00 |
| Tennessee | 112,597 00 | 57,109 00 | 55,488 00 | 158,486 00 | | 102,998 00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Missouri | [illegible] | [illegible] | [illegible] | [illegible] | ..... | |
| Illinois | 399,384 00 | 217,212 00 | 182,172 00 | 394,340 00 | ..... | 212,168 00 |
| Ohio | 490,324 00 | 246,500 00 | 243,824 00 | 504,363 00 | ..... | 260,539 00 |
| Indiana | 184,814 00 | 102,268 00 | 82,546 00 | 206,360 00 | ..... | 123,814 00 |
| Arkansas | 29,825 00 | 18,799 00 | 11,026 00 | 172,320 00 | ..... | 161,294 00 |
| Iowa | 157,725 00 | 85,201 00 | 72,524 00 | 102,336 00 | ..... | 29,812 00 |
| California | 256,994 00 | 114,022 00 | 142,972 00 | 245,831 00 | ..... | 102,859 00 |
| Oregon Territory | 12,096 00 | 5,580 00 | 6,516 00 | 28,371 00 | ..... | 21,855 00 |
| Minnesota Territory | 43,816 00 | 21,340 00 | 22,476 00 | 38,129 00 | ..... | 15,653 00 |
| New Mexico Territory | 1,641 00 | 692 00 | 949 00 | 42,991 00 | ..... | 42,042 00 |
| Utah Territory | 1,384 00 | 793 00 | 591 00 | 68,081 00 | ..... | 67,490 00 |
| Nebraska Territory | 3,929 00 | 2,237 00 | 1,692 00 | 16,168 00 | ..... | 14,476 00 |
| Washington Territory | 1,790 00 | 842 00 | 948 00 | ..... | 948 00 | ..... |
| Kansas Territory | 10,946 00 | 5,464 00 | 5,482 00 | 24,389 00 | ..... | 18,907 00 |
| | 7,070,367 00 | 3,288,789 00 | 3,781,578 00 | 6,596,152 00 | 697,732 00 | 3,512,806 00 |

| | |
|---|---|
| Amount of deficit | $3,512,306 00 |
| Deduct amount of surplus column | 697,732 00 |
| | 2,814,574 00 |

The above statement shows only the insufficiency of the net revenue to pay the regular inland transportation without embracing the foreign mails, route agents, local agents, and mail messengers, and other important items paid for directly at the Department.

| | |
|---|---|
| Paid for foreign mails, per Auditor's report | 417,220 00 |
| Paid for route agents, local agents, and mail messengers, per Auditor's report | 502,718 00 |
| Payments made at the Department, to wit: | |
| For wrapping paper | 51,776 00 |
| For advertising | 45,376 00 |
| For mail bags | 54,566 00 |
| Clerks for offices of postmasters | 29,634 00 |
| Office furniture in post offices | 623 00 |
| Miscellaneous expenses | 23,972 00 |
| | 3,940,459 00 |

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 109.

# OFFICERS, CLERKS AND OTHER EMPLOYÉS OF THE HOUSE OF REPRESENTATIVES.

## LETTERS

FROM

## THE CLERK, DOORKEEPER, AND POSTMASTER OF THE HOUSE OF REPRESENTATIVES,

IN RESPONSE TO

*A resolution calling for information as to the number of persons employed in their respective offices, with their salaries, duties, &c.*

APRIL 1, 1858.—Ordered to be printed.

OFFICE HOUSE OF REPRESENTATIVES U. S.
*March* 31, 1858.

SIR: In response to the resolution offered by Hon. Mr. Houston, of Alabama, on the 27th instant, I herewith transmit a list containing the names of all the clerks, messengers and laborers in this office, the date of their appointments, and their duties, salaries, and the authority under which they hold their respectives places.

I had the honor, on the first of January last, to transmit to you, substantially, the same list, and which was subsequently printed by order of the House. In both lists no record is made of such temporary force as is occasionally required by extraordinary demands on this office, and which force has never been employed except under positive instructions from the Committee on Accounts. I have now in my employ two extra messengers. The appointment of the first was rendered necessary by the occupancy of the new hall in the south wing of the Capitol, and the consequent necessity of frequent and speedy communication between the Clerk's desk and the various offices in the old hall. The appointment of the second messenger was for the convenience of the Committee on Accounts, and was made at the instance of the late chairman of said committee.

Very respectfully,

J. C. ALLEN,
*Clerk House of Representatives U. S.*

Hon. JAMES L. ORR,
*Speaker House of Representatives U. S.*

*A statement showing the names of each and every person appointed by the Clerk of the House of Representatives of the United States, when appointed, services performed, the salary or compensation of each, and the authority under which said appointments were made.*

| Name. | Date of appointment. | Service performed. | Salary or compensation. | Authority for appointment. |
|---|---|---|---|---|
| John F. Carter | December 8, 1857 | Chief clerk | $2,160 00 | Act April 18, 1818. |
| John M. Barclay | December 7, 1857 | Journal clerk | 2,160 00 | Do. |
| Daniel Buck | do | File clerk | 1,800 00 | Do. |
| Thomas DeKalb Harris | do | Printing clerk | 1,800 00 | Act May 26, 1824. |
| Mordecai P. Bean | December 15, 1857 | Newspaper clerk | 1,800 00 | Do. |
| Joseph C. Guild | December 18, 1857 | Engrossing clerk | 1,800 00 | Do. |
| David F. Atkins | January 18, 1858 | do | 1,800 00 | Resolution March 6, 1826. |
| William H. Topping | January 9, 1858 | Special engrossing clerk | 1,800 00 | |
| Alexander B. Norris | December —, 1857 | Petition clerk | 1,800 00 | Resolution October 11, 1837. |
| James C. Walker | December 7, 1857 | Reading clerk | 1,800 00 | Resolution September 9, 1850. |
| David A. Carter | December 22, 1857 | Tally clerk | 1,800 00 | Resolution October 11, 1837. |
| Simeon D. Reynolds | December 11, 1857 | Book clerk | 1,800 00 | Act March 3, 1853. |
| William H. Minnix | December 7, 1857 | Stationery clerk | 1,800 00 | Resolution August 31, 1852. |
| Andrew R. Potts | December 13, 1857 | Librarian House of Representatives | 1,800 00 | Resolution March 3, 1850. |
| John Bailey | December 7, 1857 | Miscellaneous clerk | 1,800 00 | Act August 18, 1856. |
| John Kitchell | do | do | 1,800 00 | Do. |
| Charles F. Cone | January 15, 1858 | Chief messenger | *4 80 | Resolution March 2, 1842. |
| John Missimer | December 7, 1857 | Messenger | 1,200 00 | Committee on Accounts. |
| Frederick Emmerich | do | do | 1,200 00 | Resolution March 2, 1842. |
| S. B. Allen | March 17, 1857 | do | 1,200 00 | Do. do. |
| John B. Perry | December 12, 1857 | Messenger, folding documents | 1,200 00 | Committee on Accounts. |
| John H. Davidson | December 14, 1857 | do do | 1,200 00 | Do. do. |
| William Hartough | December 24, 1857 | Messenger in south wing of Capitol | 1,500 00 | Resolution August 16, 1856. |
| Levi Neal | December 7, 1857 | Laborer | *1 50 | Resolution March 2, 1842. |
| John Costin | do | do | *2 00 | Resolution March 3, 1855. |
| Amasa R. Parker | do | Draughtsman on land maps | 2,160 00 | Resolution May 4, 1848. |
| J. N. Gordon | do | Clerk on land maps | 1,800 00 | Do. do. |
| Daniel McCook | December 13, 1857 | do | 1,800 00 | Do. do. |
| V. H. Worthington | do | do | 1,800 00 | Do. do. |
| George B. Wooldridge | do | do | 1,800 00 | Do. do. |
| Michael K. Boyer | December 21, 1857 | do | 1,800 00 | Do. do. |
| Henry R. Day | January 18, 1858 | do | 1,800 00 | Do. do. |
| R. D. O. Smith | December 14, 1857 | do | 1,800 00 | Do. do. |
| John P. Shields | December 16, 1857 | do | 1,800 00 | Do. do. |

* Per day.

POST OFFICE.

*Washington, March* 31, 1858.

SIR: In answer to the resolution of the House of Representatives of the 27th instant, calling upon me for certain information with reference to the force employed in this office, I would respectfully report that there is no law of Congress under which the employés in this office are appointed. The following tabular statement will, however, exhibit the authority for their appointment, as well as afford the other information for which the resolution of the House calls:

| Names of employés. | Title of position. | Salary. | Date of appointment. | Authority under which employed. | Authority under which present compensation is paid. | Remarks. |
|---|---|---|---|---|---|---|
| William H. Thomas | Assistant postmaster | $1,740 per annum | December 17, 1857 | House resolution, March 3, 1842. | House resolution, Aug. 16, '56. | Originally a messenger. Made assistant postmaster by resolution of August 16, 1856. |
| James Henry | Messenger | $1,440 per annum | January 1, 1858 | do do | Act of July 20, 1854 | |
| John Morgan | do | $1,440 per annum | December 22, 1857 | do do | do | |
| Patrick McDevitt | do | $1,440 per annum | January 6, 1858 | do do | do | |
| William C. Carr | do | $1,440 per annum | December 9, 1857 | Ordered by Com. on Accounts, 1st session 33d Congress, and appropriation made in each annual appropriat'n bill since to pay salary. | do | |
| Frederick Saxty | Mail boy | $75 per month | February 1, 1858 | House resolution, March 3, 1855. | House resolution, Mar. 3, 1855. | |
| Samuel Lee | do | $75 per month | December 1, 1857 | do do | do do | |
| William F. Corbit | do | $50 per month | March 1, 1858 | Ordered by Com. on Accounts, 1st session 34th Congress. Continued each session since. | Pay fixed by Com. on Accounts | Employed only during the sess. of Congress, and for a month preceding and succeed'g. |
| Oscar A. Coburn | do | $50 per month | February 1, 1858 | do do | do do | do do |

I will state that the force is precisely what it was when I came into the office of postmaster.

Respectfully, &c.,

M. W. CLUSKEY, *Postmaster House of Representatives.*

Hon. JAMES L. ORR, *Speaker of the House of Representatives.*

OFFICE OF DOORKEEPER,
*House of Representatives, March* 31, 1858.

SIR: In compliance with the request contained in the resolution of the Hon. George S. Houston, of 27th March, 1858, I have the honor herewith to enclose a statement showing the name of each person employed by me, the nature of the employment, time when appointed, salary or compensation of each, together with the authority by which they were appointed.

I respectfully refer you to the remarks in margin of statement in regard to the messengers and pages not employed by law.

I am, sir, very respectfully, your obedient servant,

R. B. HACKNEY,
*Doorkeeper.*

Hon. JAMES L. ORR,
*Speaker House of Representatives.*

*States, the nature of their employment, time appointed, amount of salary paid to each, and the authority for the same.*

| Name. | Nature of employment. | Time appointed. | Salary. | Law or resolution. | Remarks. |
|---|---|---|---|---|---|
| R. B. Hackney | Doorkeeper | Dec. 7, 1857 | $2,160 00 | Act March 3, 1815 | |
| Lewis Evans | Superintendent folding | Dec. 14, 1857 | 1,800 00 | Resolution Sept. 9, 1850 | |
| S. V. Hunter | Superintendent documents | Dec. 9, 1857 | $4 80 per day | Resolution July 28, 1854 | |
| S. McJunkin | Assist....do.....do | Jan. 1, 1858 | $4 80 per day | Resolution Aug. 16, 1856 | |
| S Alburtis | Messenger in charge of hall | Dec. 9, 1857 | 1,740 00 | Resolution Sept. 28, 1850 | |
| J. L Wright | Messenger | Dec. 7, 1857 | 1,500 00 | do | |
| E. V. Campbell | do | Dec. 10, 1857 | 1,500 00 | do | |
| J. L Reilly | do | Dec. 14, 1857 | 1,500 00 | Resolution March 7, 1842 | |
| Jared Dodd | do | Dec. 15, 1857 | 1,500 00 | do | |
| F. Perry | do | Dec. 23, 1857 | 1,500 00 | do | |
| George Murphy | do | Dec. 9, 1857 | 1,200 00 | do | |
| Daniel Kelly | do | Dec 8, 1857 | 1,200 00 | do | |
| D. Truesdale | do | Dec. 23, 1857 | 1,200 00 | do | |
| James Owner | do | Dec. 16, 1857 | 1,200 00 | do | |
| S. Gridley Hyde | do | Dec. 9, 1857 | 1,200 00 | do | Bookkeeper. |
| J F. Moore | do | Dec. 23, 1857 | 1,200 00 | do | |
| A. B. Morton | do | Dec. 8, 1857 | 1,200 00 | Resolution March 22, 1844 | |
| J. W. Seibert | do | Dec. 23, 1857 | 1,200 00 | Resolution Dec. 23, 1844 | |
| B. S. Schoonover | do | Dec. 15, 1857 | 1,200 00 | Resolution Dec. 23, 1857 | |
| Israel Brown | do | Dec. 23, 1857 | 1.200 00 | do | |
| J. D. Hendley | do | Dec. 14, 1857 | 1,200 00 | do | Assistant bookkeeper. |
| William P. Bell | do | Dec. 23, 1857 | 1,200 00 | do | |
| J. S. Weiler | do | Dec. 23, 1857 | 1,200 00 | do | |
| James Burtnett | do | Dec. 15, 1857 | 1,200 00 | do | |
| A. D. Simms | do | Dec. 17, 1857 | 1,200 00 | | On moving into the new hall I found it absolutely necessary, for the comfort of the members generally, to increase the force of messengers, hoping it would have met the views of Congress. |
| C. H. Hudgins | do | Dec. 16, 1857 | 1,200 00 | | |
| Washington Tilley | do | Dec 10, 1857 | 1,200 00 | | |
| Thomas O. Oliver | do | Jan. 1, 1858 | 1,200 00 | | |
| M. French | do | Dec. 16, 1857 | 1,200 00 | | |
| E. W. Dunn | do | Dec. 23, 1857 | 1,200 00 | | |
| P. Goodmanson | do | Jan. 14, 1858 | 1,200 00 | | |

## STATEMENT—Continued.

| Name. | Nature of employment. | Time appointed. | Salary. | Law or resolution. | Remarks. |
|---|---|---|---|---|---|
| James Allen | Page | Dec. 8, 1857 | $2 per day | Resolution Dec. 20, 1847 | |
| Jesse Cook | do | do | do | do | |
| Jesse E. Dow | do | do | do | do | |
| S. Lynch | do | do | do | do | |
| W. A. Hidell | do | do | do | do | |
| Charles F. Hill | do | do | do | do | |
| R. O. Holtzman | do | do | do | do | |
| Bertrand Golden | do | do | do | do | |
| Pierce Loving | do | do | do | do | |
| Frank Miller | do | do | do | do | |
| A. W. Moise | do | do | do | do | |
| Willie D. Todd | do | do | do | do | |
| J. B. Trenholm | do | do | do | Resolution March 15, 1852 | |
| Willie Worthington | do | do | do | do | |
| T. J. Steer | do | Dec. 23, 1857 | do | | It was absolutely necessary to increase the number of pages, the new hall being much larger and far removed from the document and folding rooms, where they are continually sent on errands. |
| J. M. W. Kearns | do | do | do | | |
| William Sawyer | do | do | do | | |
| Edward Burke | do | do | do | | |
| J. T. Gatewood | do | do | do | | |
| Henry Watson | do | do | do | | |
| Charles Briscoe | Laborer | Dec. 15, 1857 | $1 50 per day | Resolution Aug. 8, 1850 | |
| Henry Douglas | do | do | do | do | |
| Howard Causley | do | Dec. 23, 1857 | do | Resolution Dec. 23, 1857 | |
| Lewis Saunders | do | do | do | do | |
| Edward Thomas | do | do | do | do | |
| William Dunn | do | do | do | do | |
| William Twine | do | Jan. 18, 1858 | do | do | |
| John Burns | do | do | do | do | |
| John Johnson | Laborer in attendance to west cloak room | Jan. 1, 1858 | do | By authority Com. Accounts | |
| Samuel Phillips | Folder | Dec. 26, 1857 | $2 50 per day | Resolution Com. Accounts | |

| | | | | |
|---|---|---|---|---|
| J. C. Waddle | do | Dec. 25, 1857 | do | do |
| R. B. Jarvis | do | Jan. 7, 1858 | do | do |
| C. L. McCoull | do | Dec. 23, 1857 | do | do |
| S. D. Woodrow | do | March 3, 1858 | do | do |
| Michael Price | do | Jan. 11, 1858 | | do |
| J. S. Boak | do | Feb. 3, 1858 | $4 per 1,000 | do |
| J. H. Hopkins | do | do | do | do |
| W. M. Fisher | do | do | do | do |
| H. H. Clark | do | do | do | do |
| F. D. Dowling | do | do | do | do |
| E. S. Matthews | do | do | do | do |
| Cyrus Spangler | do | do | do | do |
| C. P. Austin | do | do | do | do |
| James Gleason | do | Jan. 29, 1858 | 75 cts pr. 1,000 | do |
| Jno. T. Bryan | do | Jan. 6, 1858 | do | do |
| Jacob Barr | do | Feb. 3, 1858 | do | do |
| J. M. Hedrick | do | Feb. 15, 1858 | do | do |
| T. E. McGraw | do | Jan. 20, 1858 | do | do |
| James K. Peyton | do | Feb. 3, 1858 | do | do |
| Thomas Stone | do | do | do | do |
| C. Simmons | do | Dec. 26, 1857 | do | do |
| E C. Woodbury | do | Feb. 3, 1858 | do | do |
| Andrew Bain | do | Dec. 26, 1857 | do | do |
| T. A. Devine | do | Feb. 3, 1858 | do | do |
| F. A. Reitz | do | March 6, 1858 | do | do |
| Frank. Barrett | do | March 10, 1858 | do | do |
| H. L. Cross | do | March 17, 1858 | do | do |
| Duncan France | do | March 18, 1858 | do | do |
| V. H. Wilson | do | do | do | do |
| T. B. Harrison | do | March 22, 1858 | do | do |
| John Hathaway | Laborer in folding room | Feb. 5, 1858 | $1 50 per day | By authority Com. Acc'nts |
| George Wooldridge | do do | do | 1 50 do | do |

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 110.

# PUBLIC PRINTING.

## LETTER

FROM THE

## SUPERINTENDENT OF PUBLIC PRINTING,

IN REPONSE TO

*A resolution of the House of Representatives, calling for a statement of the aggregate cost of public printing, &c., ordered by the 33d and 34th Congresses.*

APRIL 1, 1858.—Ordered to be printed.

OFFICE SUPERINTENDENT PUBLIC PRINTING,
*Washington, March* 31, 1858.

SIR: In obedience to the resolution of the House of Representatives of the 16th instant, requesting the Superintendent of the Public Printing to "report to this House the aggregate cost of the public printing, including cost of paper, binding, engraving, lithographing, and electrotyping, *ordered* by the thirty-third Congress, and also the aggregate cost of the same *ordered* by the thirty-fourth Congress," I have the honor to submit the accompanying statement, marked A.

It is proper to remark, that the unfinished work "*ordered*" by both Congresses has been estimated for in this report.

I have the honor to be, sir, very respectfully, your obedient servant,

GEO. W. BOWMAN,
*Superintendent.*

Hon. JAMES L. ORR,
*Speaker of the House of Representatives.*

## A.

*Statement showing the aggregate cost of the printing, &c., ordered by the 33d and 34th Congresses.*

| | Senate. | House of Reps. |
|---|---|---|
| *Thirty-third Congress.* | | |
| Printing, dry-pressing, folding, &c | $177,075 09 | $234,867 76 |
| Paper | 199,759 52 | 300,696 69 |
| Binding, (reserved and extra copies) | 227,560 11 | 310,898 48 |
| Engravings, lithographs, and electrotypes | 388,268 88 | 441,589 47 |
| Total for 33d Congress | 992,663 60 | 1,228,052 40 |
| *Thirty-fourth Congress.* | | |
| Printing, dry-pressing, folding, &c | $142,599 80 | $254,641 75 |
| Paper | 166,553 25 | 343,610 39 |
| Binding, (reserved and extra copies) | 146,433 41 | 218,599 42 |
| Engravings, lithographs, and electrotypes | 124,168 84 | 221 685 78 |
| Total for 34th Congress | 579,755 30 | 1,038,537 34 |

| | |
|---|---|
| Aggregate cost of printing, &c., ordered by the 33d Congress | $2,220,715 00 |
| Aggregate cost of printing, &c., ordered by the 34th Congress | 1,618,292 64 |

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 111.

# OFFICERS OF THE REVOLUTIONARY ARMY.

## RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF NEW YORK,

IN RELATION TO

*The claims of officers of the revolutionary army, their widows and children.*

APRIL 5, 1858.—Referred to the Committee on Revolutionary Claims.

STATE OF NEW YORK, IN ASSEMBLY, MARCH 8, 1858.

CONCURRENT RESOLUTIONS in relation to the officers of the revolutionary army.

*Resolved*, (*if the Senate concur*,) That, having witnessed with pleasure the efforts which were made during the past session of Congress for the final settlement and payment of our revolutionary debt, we consider that our government is under the most solemn obligations to carry out the promises of the continental Congress contained in the resolutions of the 21st October, 1780, January 7, 1781, and March 8, 1785, by allowing to the officers of the revolutionary army the half-pay for life to which they are entitled under the resolutions, for the payment of which the national faith is pledged. That all those senators and representatives who have taken a lively interest in behalf of the officers of the revolution, their widows and children, are entitled to the thanks and gratitude of the country.

*Resolved*, That our senators in Congress be instructed, and our members of the House of Representatives be requested, to advocate and vote for a bill to provide for the final settlement and payment of the half-pay for life which was promised by the continental Congress to the officers of the revolutionary army, who should serve to the end of the war or until the time of their reduction, deducting the value of commutation certificates issued in their names, and that the amount found due be paid to the officers, if alive, and if dead, to his widow and children equally, and if none, to the next of kin of such deceased officer; and, also, that suitable provision be made for the widows and children of those officers who were killed in battle, or died in the service; and that such bill conform to the principles contained in the

resolutions of October 21, 1780, July 7, 1781, and 5th March, 1785, and we respectfully ask the adoption of this principle and the passage of the bill by Congress, as due by every consideration of good faith, honor and justice, to those brave men who fought our battles and shed their blood in defence of our country's rights and independence.

*Resolved*, That his excellency the governor cause these resolutions to be transmitted to the President of the Senate and the Speaker of the House of Representatives of the United States, for the consideration of those bodies, respectively, and to each of the senators and representatives in Congress from this State.

In assembly, March 8, 1858. Were duly passed.

By order, &c., D. WILSON, *Clerk*.

In the senate, March 13, 1858. Were duly passed.

By order, &c., S. P. ALLEN, *Clerk*.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 112.

# QUALITY OF MUSKETS FURNISHED BY THE GOVERNMENT TO THE STATE OF NEW YORK.

## RESOLUTIONS

OF

## THE LEGISLATURE OF THE STATE OF NEW YORK,

ASKING

*That the militia of the States may be furnished with arms and equipments of the most approved models, &c.*

APRIL 6, 1858.—Referred to the Committtee on Military Affairs.

STATE OF NEW YORK.—IN SENATE, *March* 5, 1858.

Whereas, it appears from the report of the commissary general and other officers, that the muskets furnished by the federal government to the military forces of this State are of an old pattern, and unserviceable quality, and that the issue of such arms continues, notwithstanding the remonstrances of this State, and the fact that there are arms of the latest and most approved models in the United States arsenals; and whereas this State has, with great care and attention, improved her military system, and holds in readiness to serve the republic a large and reliable force, disciplined and equipped according to act of Congress; therefore be it

*Resolved*, (*if the assembly concur*,) That our senators in Congress be instructed, and our representatives requested, to urge the passage of a law which shall grant to the militia of the States arms and equipments of the greatest efficiency, and which shall greatly increase the quantity of arms issued; and also the passage of a law to improve the organization and discipline of the militia of the States.

*And be it further resolved*, That the governor be requested to transmit a copy of the preamble and resolution to each of our senators and representatives in Congress.

The above resolutions were duly passed.

By order of the senate,

S. P. ALLEN, *Clerk*.

IN ASSEMBLY, *March* 8, 1858.

The above resolutions were duly passed.

By order of the assembly,

D. WILSON, *Clerk*.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 113.

# PORTS OF JERSEY CITY AND CAMDEN.

## RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF NEW JERSEY,

ASKING FOR

*A restoration to the State of the ports of Jersey City and Camden, &c.*

APRIL 6, 1858.—Referred to the Committee on Commerce.

Whereas, New Jersey does not receive credit for the amount of commerce to which she is entitled, and suffers much inconvenience from the fact that ports in the State are attached to the revenue districts of New York and Philadelphia; and whereas her citizens engaged in the coasting trade are subjected to great loss of time and expense, from the want of a sufficient number of ports of entry, as well as by reason of the onerous laws existing in relation to the said coasting trade: therefore—

1. *Be it resolved by the senate and general assembly of the State of New Jersey*, That our senators and representatives in Congress be requested to urge the passage of a law restoring to New Jersey the ports of Jersey City and Camden, and, if necessary, to make them ports of entry; also to establish ports of entry at Tom's River and Atlantic City, and to use their endeavors to affect such modification of the laws governing the coasting trade as will remove the burdens and exactions now imposed on the owners and masters of vessels.

2. *And be it resolved*, That the governor be requested to forward a copy of the resolutions to each of our senators and representatives in Congress.

Approved March 17, 1858.

STATE OF NEW JERSEY:

I, Thomas S. Allison, secretary of state of the State of New Jersey, do hereby certify that the foregoing is a true copy of a preamble and joint resolutions passed by the legislature of this State, and approved

March 17, 1858, as taken from and compared with the original now on file in my office.

In testimony whereof, I have hereunto set my hand and affixed my official seal, at Trenton, in said State, this 2d day of April, A. D. 1858.

[L. S.]

THOMAS S. ALLISON,
*Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 114.

# ADDITIONAL LAND DISTRICTS IN WASHINGTON TERRITORY.

## RESOLUTION

OF THE

## LEGISLATURE OF THE TERRITORY OF WASHINGTON,

ASKING FOR

*The creation of three additional land districts in that Territory.*

APRIL 7, 1858.—Referred to the Committee on Public Lands.

RESOLUTION.

Whereas the settlers in many parts of this Territory reside so distant from the land office, now located at Olympia, to which, in case of conflict of boundaries, they, with their witnesses, are compelled to come by law, thereby subjecting them to great inconvenience, and an expense, in many cases, amounting to more than the actual value of the land: Therefore—

*Be it resolved by the legislative assembly of the Territory of Washington*, That our delegate in Congress be, and he is hereby, instructed to exert his influence to procure the passage of an act creating three additional land districts, one of which to be called the "Columbia River Land District," to be bounded as described by the resolution of the legislative assembly of the Territory of Washington passed December 22, 1855, and to establish the land office of said district at Vancouver, Clark county.

Passed house of representatives February 2, 1858.

J. S. M. VANCLEVE,
*Speaker of House of Representatives.*

Passed council February 2, 1858.

C. C. PAGETT,
*President of Council.*

A true copy. Attest:
[SEAL.]

C. H. MASON,
*Secretary of Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 115.

# ENROLLING CLERKS FOR THE LEGISLATIVE ASSEMBLY OF WASHINGTON TERRITORY.

## RESOLUTION

OF THE

## LEGISLATURE OF THE TERRITORY OF WASHINGTON,

ASKING FOR

*The creation of the office for enrolling clerk for each branch of the legislative assembly of that Territory.*

APRIL 7, 1858.—Referred to the Committee on the Territories.

RESOLUTION relative to enrolling clerks for the legislative assembly.

*Resolved by the legislative assembly of the Territory of Washington* That our delegate in Congress be, and he is hereby, instructed to exert his influence to procure the passage of an act to create the office of enrolling clerk for each house of the legislative assembly, said office being absolutely necessary for the proper despatch of business, and that Henry R. Croskie be allowed pay for acting in said capacity during the present session of the legislative assembly.

Passed the house of representatives February 4, 1858.

———— ————,
*Speaker of the House of Representatives.*

Passed the council February 4, 1858.

C. C. PAGETT,
*President of the Council.*

A true copy. Attest:
[SEAL.]

C. H. MASON,
*Secretary of Territory.*

TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 116.

# ATE INDIAN WAR IN THE TERRITORY OF WASHINGTON.

## RESOLUTIONS

OF THE

## EGISLATURE OF THE TERRITORY OF WASHINGTON,

RELATIVE TO

*he reports made by General Wool concerning the late Indian war in that Territory.*

APRIL 7, 1858.—Ordered to be printed.

OINT RESOLUTIONS relative to the false reports made by General Wool concerning the late Indian war in Washington Territory.

Whereas, during the late Indian war in this Territory, "General Vool and others" falsely and maliciously slandered the citizens and olunteer forces of this Territory, and utterly failed to give the citiens of this Territory adequate protection by the regular forces under is control; and

Whereas the late legislative assembly failed to mature resolutions ondemnatory of the strange and unnatural course pursued in the late ndian war by General Wool and Colonel Wright, and also failed to ass resolutions commendatory of the late volunteer organization of Vashington Territory: Therefore—

*Be it resolved*, That while we most unqualifiedly condemn the course ursued by General Wool and Colonel Wright in the late Indian war, ve respect and admire the gallant conduct of the junior officers of he regular army engaged therein.

*Resolved*, That the people of this Territory are mainly indebted to he courage, gallantry, and discipline of the late volunteer organization for the subjugation of the hostile Indians west of the Cascade mountains, and for the restoration of peace to our settlements; and to the volunteer organization of Washington Territory are the people mainly indebted for the general peace that now prevails.

*Resolved*, That the patriotism evinced and the promptness shown by men of industry, intelligence, honesty, and probity, enrolling themselves in the service of the Territory at the call of the executive; the hardships they encountered, the fatiguing scouts they endured,

the forts they erected, the roads and trails they opened into the enemy's country, and the victories they achieved, often over superior numbers, justly entitle them—officers, non-commissioned officers, and privates—to the unfeigned and heartfelt thanks of this legislature and the lasting gratitude of the people of this Territory.

*Resolved*, That it is with pleasure we acknowledge the zeal and efficiency displayed by Governor Stevens in his management of the war, and that to the prompt and faithful discharge of his duty, and for his unceasing labors and untiring energy, are the people of the Territory largely indebted for the tranquillity that now prevails; that the war was conducted not only with vigor, but with economy and good judgment, and that to him and the heads of departments, and his efficient subordinate officers generally, we tender our thanks, and those of the people whom we represent.

*Resolved*, That while condemning in the strongest terms the imbecile and miserable counsels of General Wool, which have prevailed, and which have given direction to the course pursued since the commencement of the war east of the Cascade mountains by the regular army, and though we honor him for his former valuable services to our common country, we pity the man, and allow his foul slanders to fall with contempt at our feet, and appeal with confidence to our kindred and fellow-countrymen of the United States, with the firm reliance of receiving justice at their hands, though it has been long delayed.

Passed the house of representatives January 23, 1858.

J. S. M. VANCLEVE,
*Speaker of the House of Representatives.*

Passed the council January 16, 1858.

C. C. PAGETT,
*President of the Council.*

A true copy. Attest:
[SEAL.]

C. H. MASON,
*Secretary of Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No 117.

# BETTER PRESERVATION OF LIFE AND PROPERTY ON THE NEW JERSEY COAST.

## JOINT RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF NEW JERSEY,

FOR THE

*Better preservation of life and property, and the more effective working of the government apparatus on the New Jersey coast.*

APRIL 7, 1858.—Referred to the Committee of Ways and Means.

STATE OF NEW JERSEY.

JOINT RESOLUTIONS for the better preservation of life and property, and the more effective working of the government apparatus on the New Jersey coast.

Whereas the close proximity of the New Jersey coast to the entrance to New York harbor renders it necessary for vessels bound from the east and south to pass said coast, and the peculiar formation of said coast, running from Barnegat Inlet south, in a southwesterly direction, with bars and shoals, making it probably the most dangerous coast along the Atlantic; and whereas, with our increasing maritime business, both as regards commerce and emigration, there necessarily must be, and is, an increase of disasters by shipwreck on our coast, without a corresponding increase of the means requisite for saving life and property; and whereas not more than about one vessel in twenty stranded on our shores properly belongs to New Jersey, while all the large class of vessels carrying passengers are from other States and other nations, whose dead the State of New Jersey are obliged to bury, at no inconsiderable expense, making it burdensome and oppressive, and affording the State, we believe, just cause for complaint, and demanding a remedy: Therefore—

1. *Be it resolved by the senate and general assembly of the State of New Jersey*, That our senators and representatives in Congress be respectfully requested to use their influence for and urge the passage of a bill making such appropriations for the better preservation of life and property, and for defraying the expenses incurred in burying the

dead, not citizens of this State, cast upon our shores by shipwreck, as will be more commensurate with the demand, as follows:

1. For defraying the expenses incurred in burying the dead cast upon the New Jersey coast by shipwreck, not citizens of this State, estimated at three thousand dollars.

2. Pay of two superintendents, at fifteen hundred dollars per annum, three thousand dollars.

3. Pay of station-house keepers, (twenty-eight in number,) to reside in the station-house, each two hundred dollars, five thousand six hundred dollars.

4. Pay of boat's crew (seven in number) at every alternate station-house, (fourteen stations,) subject to the call of the keeper, only when required, at two dollars per day, when in actual service, say thirty days in the year, five thousand eight hundred and eighty dollars.

5. Building four station-houses between Squam and Little Egg harbor, capable of holding three hundred persons, at one thousand dollars each, four thousand dollars.

6. For fitting up all the old station-houses in a tenantable condition for the residence of the keepers, say three hundred dollars each, seven thousand four hundred dollars.

7. For a good stove, cooking apparatus, water tank, &c., at each station-house, one thousand two hundred and sixty dollars.

8. For two barrels hard bread, and one each of pork and beef, to be placed at every alternate station-house, one thousand and eight dollars.

9. For a new wooden boat, to be placed at each station-house, four thousand two hundred dollars.

10. For replenishing apparatus, for erection of signal poles, &c., at every station; for erection of pointers at intermediate places between the stations, directing the lost mariner to the nearest place where shelter and relief can be had; for three six-pounds guns, to be placed at every alternate station-house, to be used as signals to call aid from the main, and also to warn vessels in port and at sea of an approaching storm, say three thousand seven hundred dollars.

11. To encourage and reward the heroic efforts of those who jeopard their lives to save the lives and property of the shipwrecked, to be paid at the discretion of the Secretary of the Treasury of the United States, say one thousand dollars.

12. For constructing an electro-magnetic telegraph line from the present terminus of the Sandy Hook telegraph, at Squam village, along the coast to Cape May, by which the east and northeast storms (which generally commence south and work north) may be anticipated, and information received at the different stations from twelve to thirty-six hours in advance of their arrival, allowing time to call the crews from the main, and have the apparatus in a state of readiness for an emergency, estimated at fifteen thousand dollars.

13. To authorize Lieutenant M. F. Maury, of the National Observatory and Hydrographical Office, at Washington, to receive telegraphic weather reports from such points as he may deem most advantageous, and to transmit to the New Jersey coast necessary intelligence of approaching storms in order that the whole apparatus

for saving life and property may be worked advantageously and effectually.

14. For supplying copies of Lieutenant Maury's "Chart and Sailing Directions from Sea to Sandy Hook" to vessels on receiving their clearance from ports of the United States, through the collectors of said ports, or such medium as the Secretary of the Treasury may deem best, estimated at ——.

2. *And be it resolved*, That his excellency the governor of this State be, and he is hereby, respectfully requested to transmit to each of our senators and representatives in Congress a copy of the above resolutions and preamble.

3. *And be it resolved*, That the governor of this State be further requested to transmit a copy of the above resolutions and preamble to the governors, respectively, of the States of Maine, New Hampshire, Rhode Island, Massachusetts, Connecticut, New York, Delaware, Maryland, Virginia, South Carolina, North Carolina, Georgia, and other States interested, requesting them to present the matter before their respective legislatures.

Approved March 18, 1858.

STATE OF NEW JERSEY:

I, Thomas S. Allison, secretary of state of the State of New Jersey, do hereby certify that the foregoing is a true copy of a preamble and joint resolutions passed by the legislature of this State, and approved March 18, 1858, as taken from and compared with the original now on file in my office.

In testimony whereof, I have hereunto set my hand and affixed my [L. S.] official seal, at Trenton, in said State, this second day of April, A. D. one thousand eight hundred and fifty-eight.

THOMAS S. ALLISON,
*Secretary of State.*

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EXECUTITE DEPARTMENT OF NEW JERSEY,
*Trenton, New Jersey, April* 2, 1858.

I have the honor to transmit herewith a copy of joint resolutions passed by the legislature of this State, agreeably to the requirements of said resolutions.

Most respectfully, your obedient servant,

WM. A. NEWELL,
*Governor of New Jersey.*

Hon. GEORGE R. ROBBINS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 118.

# LANDS FOR AGRICULTURAL COLLEGES.

## RESOLUTIONS

OF

## THE LEGISLATURE OF THE STATE OF NEW JERSEY,

ASKING FOR

*A donation of public lands for agricultural colleges.*

APRIL 7, 1858.—Referred to the Committee on Public Lands.

STATE OF NEW JERSEY.

JOINT RESOLUTIONS relative to obtaining from the United States a donation of public lands for the founding and maintaining of an agricultural college in the State of New Jersey.

1. *Be it resolved by the senate and general assembly of the State of New Jersey*, That the senators and representatives in Congress of this State be, and they are hereby, requested to use their best exertions to obtain from the general government a donation of public lands to this State, in common with the other States of the Union, for the founding and maintaining, in each of the several States, of an agricultural college for the promotion of the science and practice of agriculture; and, for that purpose, to favor any proper bill which is now depending, or which shall hereafter be presented, before the two houses of Congress, the object of which may be to secure such donation.

2. *And be it resolved*, That the governor of this State be, and he is hereby, requested to transmit a copy of these resolutions to each of our senators and representatives in Congress.

Approved March 18, 1858.

STATE OF NEW JERSEY:

I, Thomas S. Allison, secretary of state of the State of New Jersey, do hereby certify that the foregoing is a true copy of joint resolutions passed by the legislature of this State, and approved March 18, 1858, taken from and compared with the original now on file in my office.

In testimony whereof, I have hereunto set my hand and affixed my official seal, at Trenton, in said State, this second day of April, anno Domini one thousand eight hundred and fifty-eight.

[L. S.]

THOMAS S. ALLISON,
*Secretary of State.*

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EXECUTIVE DEPARTMENT OF NEW JERSEY,
*Trenton, N. J., April* 2, 1858.

I have the honor to transmit herewith a copy of joint resolutions passed by the legislature of this State, agreeably to the requirements of said resolutions.

Most respectfully, your obedient servant,

WM. A. NEWELL,
*Governor of New Jersey.*

Hon. GEORGE R. ROBBINS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 119.

# WHATCOM—PORT OF DELIVERY.

## RESOLUTION

OF THE

## TERRITORY OF WASHINGTON,

ASKING.

*That Whatcom, in that Territory, may be made a port of delivery.*

APRIL 7, 1858.—Referred to the Committee on Commerce.

RESOLUTION for the establishment of a port of delivery at Whatcom.

*Resolved by the council, the house concurring,* That our delegate in Congress be, and he is hereby, instructed to use his influence with the Congress of the United States to procure the passage of a law to establish a port of delivery at Whatcom, in Washington Territory, and to provide a surveyor and inspector of customs for said port.

Passed house of representatives January 20, 1858.

J. S. M. VANCLEVE,
*Speaker of House of Representatives.*

assed council January 19, 1858.

C. C. PAGETT,
*President of the Council.*

[SEAL.] A true copy. Attest:

C. H. MASON,
*Secretary of Territory.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No 120.

# PENITENTIARY IN KANSAS.

## MEMORIAL

OF THE

## GENERAL ASSEMBLY OF THE TERRITORY OF KANSAS,

ASKING AN

*Appropriation of money for the erection of a penitentiary.*

APRIL 13, 1858.—Referred to the Committee on the Territories.

MEMORIAL TO CONGRESS for an appropriation to build a penitentiary in the Territory of Kansas.

*To the honorable the Senate and House of Representatives of the United States:*

The memorial of the legislative assembly of the Territory of Kansas, respectfully represents: That an act has passed this body and was approved February, 1858, entitled "An act to locate the penitentiary," a copy of which is herewith transmitted to your honorable body.

That there are at present no efficient county jails in the Territory, from the fact that it has been impossible to impose sufficient taxes upon the people to build the same, as but little property in Kansas is, at the present time, subject to taxation for general purposes, owing to delay in the land department in opening the public domain to pre-emption, consequently a territorial penitentiary is indispensable to the security of life, property, and public morals, while we, as a people, have no means of furnishing a revenue adequate to such work.

That your memorialists are apprehensive that there are an unusual number in their community who need to feel the firm fingers of the law to restrain them from the commission of crimes, and that laws are inoperative without a penalty, otherwise than by fine for the higher crimes: Therefore, believing it to be consistent with section thirty-three of the organic act of this Territory—

Your memorialists would respectfully recommend to your honorable

body the appropriation of such sums of money, not less than one hundred thousand dollars, as you may deem necessary for the purpose of erecting a penitentiary, in accordance with the act here appended.

G. W. DEITZLER,
*Speaker of House of Representatives.*
C. W. BABCOCK,
*President of the Council.*

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AN ACT entitled "An act locating the penitentiary."

*Be it enacted by the governor and legislative assembly of the Territory of Kansas as follows:*

SECTION 1. The penitentiary of the Territory of Kansas shall be, and is hereby, located at Delaware city, in the county of Leavenworth.

SEC. 2. As soon as the necessary appropriations for the erection thereof are made, the commissioners, hereinafter provided for, shall proceed immediately to procure a site, and to erect the necessary buildings.

SEC. 3. The legislature shall elect, by joint ballot, at the present session, three commissioners, who shall be styled the Penitentiary Commissioners—one for three years, one for two years, and one for one year; and the legislative assembly shall, each year thereafter, elect one commissioner, who shall hold his office for three years, and until his successor is elected and qualified, whose duties shall be prescribed by law.

SEC. 4. An act entitled "An act to locate the penitentiary," approved February 17, 1857, is hereby repealed.

This act to take effect and be in force from and after its passage.

Approved February 9, 1858.

ITH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 121.

# 'ILLIAM W. HUBBELL'S IMPROVEMENT IN EXPLOSIVE SHELLS.

## CERTAIN PAPERS

RELATING TO

# 'M. W. HUBBELL'S IMPROVEMENT IN EXPLOSIVE SHELLS.

PRIL 17, 1858.—Referred to the Committee on Naval Affairs and ordered to be printed.

*eport submitted to the Committee on Naval Affairs by Mr. Florence, to whom was referred the petition and papers of W. W. Hubbell by the said committee.*

The petition of Wm. W. Hubbell, of Philadelphia, for compen-tion, with a copy of his patent for "improvement in eccentric xplosive shells" annexed thereto, has been duly considered, and ports from the Navy Department obtained.

The first report, dated February 20, 1858, including one from aptain Dahlgren, dated April 2, 1856, received from the Bureau of rdnance and Hydrography, being not fully responsive to the petition nd patent, further information was requested, by letters of March 11 nd 16, 1858, addressed to the Hon. Isaac Toucey, Secretary of the lavy, copies of which are annexed and, excepting as to the number f patent shells in the service, the information has been furnished nd is appended hereto. The clerical force is not sufficient at present o ascertain the number that has been made and the number on hand, s contained in the 3d and 4th questions in the letter of March 16th.

The drawings of these shells in the service are annexed, marked "12-pounder shrapnel," "24-pounder shrapnel," and "8-inch shell;" "approved October 28, 1846."

The identical patented invention of Mr. Hubbell, as shown by these drawings, and the accompanying reports from the bureau, dated, respectively, March 17 and April 2, 1858, is used for 8-inch guns, and or shrapnel shells at the present time in both 12 and 24-pounders.

These drawings correspond with the drawings, specifications, and laim of the patent in every particular. The claim being in the words of he patent, for "the combination of the head or segment of the solid phere with flat base uniformly around the fuze hole, with the segment of

the hollow part, forming a spherical shell with flat based head, and externally smooth, as described;" and they are used as required by the patent—that is, with "*metallic* fuzes."

The report of the officer of ordnance at the navy yard, dated April 2, 1856, has been fully considered. He says that, in his opinion, he does not profess to have reference to the patent law. He appears to misapprehend the scope of Mr. Hubbell's invention and his patent, and not to be aware of the records in the department authorizing its preparation in 1842. The patent is not simply for a reinforce irrespective of other elements.

His patent is for the combined elements of a "smooth spherical external surface, free from lugs," a solid or flat reinforce around the fuze, the fuze being a "metallic one," with the body of the shell behind the reinforce, of uniform thickness, constituting a shell adapted to fire from shell-guns.

The shells referred to by Captain Dahlgren as being very old, 1766, &c., had lugs in front on the external surface, had no metal fuse, and no reinforce around the fuze. They were reinforced behind, were weakest in front, had a wooden or slow match fuze, lighted by hand and easily blown out in exploding the shell, were designed and adapted for mortars, and not for "cannon or shell guns," and were different both in their combined elements and manner of use from Mr. Hubbell's invention. They were also different in their combined elements from the large shells now used in the new large nine and eleven-inch Dahlgren shell-guns of the service.

The shells for these new sizes of large guns for the steam frigates have the combined elements of "a smooth spherical external surface, free from lugs," a flat reinforce opposite or concentric with, though not around the fuze; the fuze "a metallic one," and the body connected to the reinforce of uniform thickness; and, although the relative arrangement of the reinforce being opposite instead of around the fuse, though both concentric with the metal fuse, strictly makes only an indirect infringement of Mr. Hubbell's patent; yet all the elements combined in one shell, which were first combined and used by him to fire from shell-guns, are contained in and constitute those large shells for the new shell-guns, by which their effect is increased beyond that of the Paixhan shells, formed or adapted to and combined with a wooden fuse that existed before Mr. Hubbell's invention.

Mr. Alger, of whom the report speaks, does not appear to have ever claimed or invented, or attempted to prove a right to this invention. He had no metallic fuse, but, as shown by the report of the Bureau of Ordnance of April 2, 1858, simply invented "a paper-case fuse," which was adopted in 1846, not 1843, and in 1847 the "metallic" fuse was adopted in Mr. Hubbell's shell, which he proves that he had made and examined and tried in 1842 and 1843, in pursuance of the orders issued by the Board of Navy Commissioners, August 22, 1842, produced by the bureau, and that he bore all the expense except for twelve shells.

The patentee, therefore, is entitled to the credit of first combining the elements in one shell, now contained in those in the service for the new large size shell-guns; and, though indirectly infringing his

patent, yet an infringement is apparent, as they contain, or are made up of all the elements that he was the first to combine in one shell, to adapt it to be fired from cannon or shell-guns at high velocity, to penetrate solid bodies and to explode with greater effect than the Paixhan shell. The safety of and strain on the gun, the accuracy of fire, extent of range, the strength, penetration, and effective power of explosion of these shells all depend on his combination of elements.

The evidence shows that no one before Mr. Hubbell discovered that a spherical shell adapted to, and used with, a "metallic" fuze formed the best projectile to fire from shell-guns, and that his experiment comprised the invention of no less than nine forms of shells to develop this important truth. He, therefore, is the first and original inventor.

The reports from the Bureau of Ordnance, with drawings, exhibit the fact, that all the eight-inch shells, and the twelve and twenty-four pounder shrapnel shells in the naval service at present, are used with metallic fuzes, and are formed *identically* the same as his patent, and therefore *directly* infringe it.

Prior to its adoption, the shells in the service were formed with a neck adapted to support a conical wooden fuze stock, being the Paixhan shell, which is not now made.—(See draft, "March 1841," annexed to report of Bureau of Ordnance of April 2, 1858.)

Mr. Hubbell combined the internal and external form and arrangement of the metal of the shell in such a manner that a metallic fuze could be most firmly supported, notwithstanding its weight; and he increased the strength of the shell, increased the weight of the front part, making it the heaviest, including the weight of the metallic fuze, and obtained the largest powder space capable of being entirely filled inside the shell, in proportion to its weight and strength; increased thereby its effective explosive power beyond that of the wooden fuze shell or Paixhan shell, (as the wooden fuze must easily blow out,) and he was the first to have it made, and used it with a metallic fuze for the government as early as 1842 and 1843, at the West Point foundry and Philadelphia, in pursuance of the orders of the Navy Commissioners, dated 22d August, 1842.

It is now used in the service with metallic time-fuzes altogether, for which its great strength in the small sizes of shells, and its large internal space, particularly for the twelve and twenty-four pounder shrapnel shells, make it manifestly advantageous.

He claims to have expended $5,453 in constructing targets and shells, and making experiments; produces evidence of numerous experiments made by him, from which it appears he is also the inventor of a secret manner of exploding shells on concussion, which is now officially ordered to be tried by this government at Fort Monroe, he having first exhibited its effects, *at his own expense*, at Philadelphia, and lastly at the Washington navy yard, in 1857, in consequence of the doubts expressed in the report of the officer of ordnance beforehand, dated April 2, 1856.

Some of his experiments were matters of public notoriety in newspapers of the day as early as 1843. One publication of his experiments at Sandy Hook, duly proved, from the "New York Herald," of

August 13, 1843, is annexed. Also an official report of another, at Philadelphia, at his expense, and others shown by the exhibits in proof.

Besides $5,453 expenses, he claims the sum of $10,000 for the past and any future use of his patented invention, making a sum total of $15,453.

As matter of evidence to support this present claim for the manner of casting shells adapted to and used with a metallic fuze, he produces his original letters patent, duly granted by the "United States of America," vesting in him the exclusive right to the invention for fourteen years, from the 22d of January, 1856, a copy of which patent, with his petition, is annexed. He also produces evidence, certified from the Patent Office, as provided by law, of original documents, consisting of specifications and drawings, remaining of record, exhibiting the reinforcing of the foremost part of shells, and bearing date of execution, before witnesses, on December 5, 1840, and proved under oath, which is prior to the use of the neck, in 1841, with a wooden fuze in the service. He, therefore, first began, and subsequently first perfected, the principle now in use. Also, he produces evidence of original records from the Patent Office, executed under oath, respectively, January 24, 1842, March 12, 1842, and March 9, 1843; that of March 12, 1842, shows the secret principle of exploding shells; that of March 9, 1843, shows the reinforce applied to spherical shells, complete, with a metallic fuze, as secured by the patent. He exhibits a certified copy in evidence, not annexed hereto, as the original remains as a caveat on file in the secret archives, inasmuch as it also contains the secret manner of exploding shells, not yet publicly made known. Also, evidence of the mechanic who did some of the work on the shells in 1841, 1842, and 1843, with a bill of patterns and shells, the same as the patent of date January 7, and February 17, 1843. Also, evidence of his having the patented shells cast in Philadelphia, and at the West Point foundry, for public trial, in the autumn of 1842, and January and spring of 1843, in pursuance of orders issued by the Board of Navy Commissioners, with the consent of the Secretary of the Navy, August 22, 1842, to Commodore Wadsworth, then inspector of ordnance, and also to the Philadelphia navy yard. All of which original specifications, evidence, and the original order issued by him to the West Point foundry, proved in evidence, remain of record in the Patent Office. Copies of these papers, (except the secret caveats of March 12, 1842, and of March 9, 1843,) also, of the orders issued by the Navy Commissioners, furnished by the department on request, in the report of April 2, 1858, are hereto annexed.

An official report made by Lieutenant W. A. Wurts of a successful trial, demonstrating the efficiency of the patentee's invention, and of his manner of exploding shells, the same in form as the patent, being the 6-pounders testified to by the mechanic, Mr. Hollingsworth, as made January 7, 1843; the trial made below the Philadelphia navy yard, April 27, 1843, at his expense; and original letters from Commodore Wadsworth and Colonel Bomford, ordnance officers, to him, both before—on December 5, 1842, and, subsequently, on May 14 and 15, 1856—on the subject of "further examinations" of his

inventions, and of other trials, are produced, and a copy of this report and these letters are annexed.

This invention was, therefore, brought by the patentee to the official notice of the government in 1842, and, under the orders from the department, and the drawings furnished by Mr. Hubbell, it was exhibited by him and publicly made, at the West Point foundry, in the autumn of 1842 and January, 1843, where the government shells were then cast.

The extensive use of the patentee's form of shell casting, with metallic time fuses, in the service, has been without his consent, while he had it caveated in the Patent Office, and has been perfecting his improved manner of exploding the shells on concussion to a higher degree of efficiency, and also of rotating them out of the shell-guns by a patent sabot, which he has at his own expense exhibited, and is now on trial as a secret invention of unequalled effective power, partly at government expense, as stated in his petition.

This secret invention has no relation to shrapnel shells, in which his patented invention is extensively used. It is intended for a superior effective power for the new large shell-guns of the naval service and the fortifications.

His necessities require the prompt payment of this claim for the use of his present patent in the smaller guns, to clear him of the expenses and debts to which he has been subjected. To this he testifies in his petition, and claims it as his right, before confiding a full knowledge of his other improvements to the government use.

It would be unlawful, unjust, and illiberal in the government to use his patented invention, or his form of casting the shell with a metallic fuse, with any design or for any purpose in the ordnance, without remuneration or compensation.

The true construction of his patent, and the extent of his invention, in fact, is so comprehensive, that it cannot be dispensed with, without destroying the shells now in the naval service, and again resuming the use of the old Paixhan shell of 1841, with a wooden fuze-stock, a drawing of which is furnished by the bureau, marked "March, 1841," and which was the kind in use at the time (1842 and 1843) when Mr. Hubbell first made his invention for the government.

He first made the spherical shell, formed and adapted to and used with a metallic time-fuze, to fire from shell-guns; and the only difference now between his entire invention, including the secret improvements, and that now used is, that the naval shells explode only on time, and his secret new improvement possesses the superior power, as shown by Lieutenant Wurts' report, of exploding on concussion also, at any undetermined distance on entering a vessel-of-war or penetrable fortification.

The unexplained object in the mind of the officer at the navy yard, for which he uses the invention and states as different from that of the patentee in his large shell-guns, does not justify the use of the thing patented. The same newly combined elements secured by the patent exist in both. The mental object with which a patented invention is used, for the same general purpose of a war projectile fired from shell-guns, does not justify or avoid infringement.

The combined internal and external form of shell or arrangement of metal, used with a metallic fuze, is the thing patented. He is the first and original inventor it; first made it for the government; and he is entitled to all the benefits capable of being derived from it, both for shrapnel and the larger or eight-inch shells. Its regular adoption in 1846 and 1847 and past and present use in the service are proof of its utility, and the number made, and used, and now on hand is such that, with the present clerical force of the Bureau of Ordnance, it cannot readily be ascertained. Its nature, being a war projectile, requires that to this or other governments, if necessity compels him, and not individuals, he must look for the use of and pay for the invention, and also for patronage in the improvements in exploding shells on concusion, which he at present keeps a secret, and the power and importance of which to the American navy and fortifications are very clearly shown from the report of Lieutenant Wurt, of April 27, 1843, and the annexed recommendation of Major Bell and Captain Dahlgren, of January 4, 1858, to transfer the firing of them from the Washington navy yard battery and practice ship to a post (Fort Monroe) under the colonel of ordnance, where their full explosive power could be employed in the large shell-guns without injury to passing vessels.

His petition to be paid at present for the patent now in use is a just one. He has expended his money, many years of his time, and his ability, successfully for the public service. He is a lawyer, experienced in scientific matters, and his time and services are valuable, both to himself and to the country.

The Secretary of the Interior and the Commissioner of Patents have granted to him the patent right upon full proof of record. He is the first and original inventor of it. The present extensive use of the invention by the government is illegal. The sum petitioned for is a moderate one.

He is, therefore, entitled to be paid at the present time the reasonable sum asked, viz: fifteen thousand four hundred and fifty-three dollars, in discharge of his expenses, and the past and future use of this invention, patented 22d of January, 1856, in the United States service.

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AN ACT concerning the use and manufacture of Hubbell's explosive shells in the United States service.

*Be it enacted by the Senate and House of Representative of the United States of America in Congress assembled,* That the Secretary of the Navy be, and he is hereby authorized to obtain, from William W. Hubbell, of Philadelphia, his heirs or administrator, a grant to use and manufacture his "improvement in eccentric explosive shells," now in the service, patented by him for fourteen years from the twenty-second of January, one thousand eight hundred and fifty-six; and the sum of fifteen thousand four hundred and fifty-three dollars is hereby appropriated, out of any moneys in the treasury not otherwise appropriated, to pay for the same.

*To the Senate and House of Representatives of the United States in Congress assembled:*

The petition of William W. Hubbell, of the city of Philadelphia, State of Pennsylvania, respectfully represents: That your petitioner is the first and original inventor of a new and useful improvement in eccentric explosive shells, for which letters patent of the United States, vesting in him the grant of the exclusive right to make, vend, and use the same, "for fourteen years from and after the 22d day of January, A. D. 1856," were issued according to the acts of Congress in such cases made and provided. That the said improvement consists of an eccentric form of casting, combining superior strength to penetrate without fracture, large space inside of the shell, a firm support for a metallic fuse, and a more uniform strength of metal around the explosive contents of the shell; being important improvements for the naval and military service.

That the said patented invention of your petitioner is now in extensive use in the naval and military service of the United States in the projectiles designated shrapnel shells, and is also in use in the navy in some of the shells for large guns. That it has been of great service in the large guns in the Mexican war, and in the regular service, both in large shells and in the smaller size or shrapnel shells.

That your petitioner was authorized to exhibit his improvements in explosive shells by the late Hon. A. P. Upshur, Secretary of the Navy, in the year 1842, to the late Commodore Alexander S. Wadsworth, chief inspector of ordnance of the navy. That your petitioner did exhibit his said invention, and had the same cast by the West Point Foundry Association of New York, upon the advice and at the suggestion of said inspector of ordnance, in the month of January, 1843, and in said year executed a caveat of said invention, and subsequently filed the same in the patent office.

That said eccentric casting was part of a great system of projectiles, which your petitioner has perfected, viz: the "Thunderbolt Shell," which is a secret projectile of immensely superior effective power, and is now on trial by a joint board of officers, appointed by the Secretaries of the War and Navy.

That your petitioner, from the year 1840 up to the present time, has made many expensive experiments with explosive shells, particularly with his eccentric shell, which have resulted in many valuable improvements in projectiles for increasing the efficiency of our naval vessels and fortifications, which are held as secret inventions, and now on trial as aforesaid.

That your petitioner has incurred debts, and expended a considerable sum of money during said period, to wit, the sum of five thousand four hundred and fifty-three dollars ($5,453) in experimenting with projectiles resulting in said improvements. That he now needs the payment by the United States to him of a reasonable sum to reimburse him for his said expenses, and pay for the use of his invention already had by the naval and military service.

That the use of the same now in the naval and military service is

in violation of the grant of the exclusive right to him of the same, made by the government by virtue of his letters patent.

That although the trial of the "Thunderbolt Shell," now being made by the government, is at the government expense, yet your petitioner necessarily is subjected to considerable personal expense, and needs funds, as well to defray them as to discharge obligations he has heretofore incurred to carry on experiments of which the United States alone so far has reaped the benefit by the use of his eccentric shell casting in the service.

In order, therefore, to relieve your petitioner at the present time, he prays Congress to pass a law authorizing the payment to him, his heirs or assigns, of the sum of fifteen thousand four hundred and fifty-three dollars. The sum of $5,453 thereof to reimburse him for expenses incurred in experiments made with explosive shells, and the sum of $10,000 thereof in consideration of the past use of his eccentric shell casting in the naval and military service of the United States, together with a grant or license under his said patent of the right to continue the manufacture and use of the said eccentric castings for shrapnell shells.

A copy of the specifications of the said patent is annexed.

WM. W. HUBBELL.

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CITY OF PHILADELPHIA, }
*State of Pennsylvania.* } *ss.*

On this the thirtieth day of January, A. D. 1858, before me, the subscriber, one of the aldermen of the city aforesaid, personally appeared William W. Hubbell, the aforesaid petitioner, who being duly sworn according to law, did depose and say that the facts set forth in the foregoing petition are true to the best of his knowledge and belief.

CHARLES D. FREEMAN,
*Alderman and Justice of the Peace.*

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PATENT.

"REISSUE, No. 521."

*The United States of America to all to whom these letters patent shall come:*

Whereas, William W. Hubble, of Philadelphia, Pa., has alleged that he has invented a new and useful "improvement in eccentric explosive shells," (for which letters patent were issued to him, bearing date January 22, 1856, which letters having been surrendered by him, the same have been cancelled and new letters ordered to issue to

ıim on an amended specification,) which he states has not been known ›r used before his application; has made oath that he is a citizen of he United States, that he does verily believe that he is the original ınd first inventor or discoverer of the said improvement, and that the ıame hath not, to the best of his knowledge and belief, been pre-ıiously known or used; has paid into the treasury of the United States the sum of fifteen dollars, and presented a petition to the Commissioner of Patents, signifying a desire of obtaining an exclusive ›roperty in the said improvement, and praying that a patent may be granted for that purpose.

These are, therefore, to grant, according to law, to the said William W. Hubbell, his heirs, administrators, or assigns, for the term of ourteen years from the twenty-second day of January, one thousand ıight hundred and fifty-six, the full and exclusive right and liberty ›f making, constructing, using, and vending to others to be used, the ıaid improvement, a description whereof is given in the words of the ıaid William W. Hubbell in the schedule hereunto annexed, and is nade a part of these presents.

In testimony whereof, I have caused these letters to be made patent, and the seal of the Patent Office has been hereunto affixed. Given under my hand at the city of Washington this nineteenth day of January, in the year of our Lord one thousand eight hundred and fifty-eight, and of the independence of the United States of [L. S.] America the eighty-second.

JACOB THOMPSON,
*Secretary of the Interior.*
J. HOLT,
*Commissioner of Patents.*

Countersigned and sealed with the seal of the Patent Office.

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*Copy of the specification of Wm. W. Hubbell. Patent for "improvement in eccentric explosive shells," for fourteen years, from January* 22, 1856. *Re-issue No.* 521. *Issued January* 19, 1858.

"The schedule referred to in these letters patent, and making part of the same.

"Be it known that I, William W. Hubbell, of the city of Philadelphia, State of Pennsylvania, have invented a new and useful improvement in eccentric explosive shells, and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the annexed drawings.

"The nature of my invention consists in arranging a given weight of metal for a spherical shell of any size, to fire from cannon or shell-guns in such manner that the greatest amount of *vis inertia* is obtained to keep or retain the fuse hole in front in the flight of the shell with the least proportionate displacement of the powder space in the interior

of the shell, by combining with, and uniformly around, the fuse hole the flat based segment of a solid sphere, and with and behind this the segment of a hollow sphere forming externally a smooth spherical surface, and internally the eccentric form with flat base around the fuse hole. In the accompanying drawing, figure 1, is a section through the fuse hole head and centre of the shell; A is a flat based segment of a solid sphere, having the fuse hole "B" through its centre cast on to a segment "C C" of a hollow sphere in one piece therewith, the two segments forming a perfectly smooth spherical external surface "F F," free from lugs, ears, wings, or any other metallic protuberance on such external surface; "D D" is the flat base of the head; "E" is the metal of the hindmost part of the shell; "G" is the hollow or powder space to contain the exploding powder. In figure 2, which represents a front view of the shell, "A" is the external front surface of this head, and "B" is the fuse hole in or through the centre of the head. The dotted lines "D D" show where the hindmost segment connects with the head. "F F" is the external surface. This form of head must have the fuse hole through its centre; the external surface of the shell must be spherical, free from lugs, ears, or other protuberance of metal; and the hindmost part of the sphere, as it recedes from the base, must be of the same or uniform thickness throughout, or slightly diminish in thickness toward the rear part E, as is often occasioned by the rising of the core in casting the shell in order to obtain the conditions of my invention. The *vis inertia* of the head over the *vis inertia* of the metal of the hinder part of the shell is increased by the proportional increase of thickness of the head, and diminished by the proportional diminution of thickness of the head.

As a general rule to make the thickness of the head through the fuse hole twice as great as the thickness of the metal of the hinder part of the shell gives a good standard practical effect, and to diminish or increase this proportional thickness of the head, diminishes or increases the intensity of the *vis inertia* of the head over the *vis inertia* of the hinder part, though still preserving the least displacement of the powder space in proportion to such preponderance of the *vis inertia* of the foremost over the *vis inertia* of the hindmost part of the shell. The fuse used should be a metallic one in order to have its weight co-operate largely in favor of the *vis inertia* or weight of its head, and the ordinary sabot of hard wood should be used on the hindmost part of the shell in order to hold the shell while passing out of the gun in the same position that it will naturally occupy in its flight. Experiments with this arrangement of metal of the shell, fired with the ordinary sabot of ash wood and the fuse foremost in the gun, have proved it to fly with precision, have great strength to penetrate without fracture, and explode with uniformity. I am aware that both spherical and oblong shells having eccentric hollows and reinforcements around the fuse hole have been used before my invention, and I do not claim such arrangement of metal nor their effects. They all differ materially from mine in their collective effects.

What I claim as my invention is the combination of the head or

segment of the solid sphere with flat base uniformly around the fuse hole, with the segment of the hollow part forming a spherical shell with flat based head and externally smooth, as described.

WM. W. HUBBELL.

Witnesses:
CHARLES D. FREEMAN,
PENROSE FELL.

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THE UNITED STATES PATENT OFFICE.

*To all persons to whom these presents shall come, greeting:*

This is to certify, that the annexed is a true copy from the files of this office, of a paper filed in the matter of the application of William W. Hubbell, in accordance with which letters patent were issued to the said William W. Hubbell, on the twenty-second day of January, eighteen hundred and fifty-six, for an improvement on eccentric explosive shells.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-third day of February, in the year of our Lord one thousand eight hundred and fifty-six, and of the independence of the [L. S.] United States the eightieth.

C. MASON.

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DECEMBER 4, A. D. 1840.

The above are drawings of two fire bombs and a flying cannon. That marked fig. 1 and fig. 2 is a double exploding fire bomb. That marked fig. 3 is a single exploding fire bomb. Fig. 4 is a percussion cap belonging to the bombs. Fig. 5 is a flying cannon. Invented by William W. Hubbell, of the township of Moyamensing, county of Philadelphia, State of Pennsylvania, December 3, 1840.

The following is a description of the double exploding fire bomb, showing its mode of construction and operation:

A A is the outer shell, and B B is a shell inside of the shell A A. The ends of the shell A A are semi-globular, the side between these semi-globes is perfectly straight; D is a tube on which to place the percussion cap, the exterior lower part of this tube is screw-cut; E is a touchhole, extending through the tube into the area between the shell A A and the shell B B; B B is the inner and second exploding shell, the ends of this shell are also semi-globes, *the front end next to the tube D is larger than the other end,* and is solidly connected (in casting) with the outer shell A A. The solid connexion is represented by fig. 2, which is drawn to show the manner in which the touchhole E runs from the tube D through the solid connexion to the area between the two shells, A A being the outer shell; fig. 1, letter I, is the

touchhole of the inner shell B B; this shell is placed nearer the front part of the outer shell, so that the area between the two shells is greatest at the back part; next to the tail H H is a double tail, one crosses the other at right angles, so that while one is horizontal the other is perpendicular; G is a piece of iron screwed into the opening in the shell A A up against the screw F, which is screwed in an opening in the shell B B; the screw G has on its end a small pin which fits into the screw F but does not pass through it; the openings in which these screws are placed are cast in the shells. C C combustible missiles, as many in number and of such size as may be deemed proper for the bomb; they are prepared in the following manner: First, take pieces of white pine wood and bore several holes through them in various directions and raise small chips on them, then soak them for about a couple of days in spirits of turpentine, then take them out and dry them, then take thin combustible paper and roll powder in it, this paper is then to be inserted through the holes in the blocks several times, and also to be wrapped round the block, which, in this state, is to be immersed in melted brimstone; it is then to be taken out and dried, after which the paper is to be cut at the holes, and also in various parts where it is wound round the block, so that numerous ends of it may be exposed for it to ignite readily upon the explosion of the bomb; the blocks are then to be placed inside of the shell B B through the opening represented in the drawing as occupied by the screws G and F; a little brimstone, powdered very fine, is also to be placed inside of the shell B B; both shells are also to be filled with powder through these openings; the screws F and G are then to be secured in. The front end of the shell A A is thicker than the tail end; in the tube at the front end may be placed a wooden plug, if it is desired that the bomb shall be stowed away before the bomb is discharged. The touchhole is to be primed, then a percussion cap made to fit the tube is to be placed on. This cap is represented in fig. 4, it consists of two distinct and separate parts; K is the cap containing the fulminating powder, its shape is a segment of a cone. L is a cap, thicker than the cap K; it fits over the cap K and has a female screw cut in it, so that it may be screwed on to the tube; the cap K is to be placed on the tube, and over it is to be placed the cap L. The cap L has no top, and is screwed on to the tube; being of a conical shape, it holds the cap K on, but leaves an opening for the cap K (when it strikes any object) to fly down further on to the tube and explode. The bomb is to be fired out of a cannon, and is to be used in naval engagements, besieging of towns, cities, forts, &c. The tail H is to be placed in the cartridge cover, which is then to be filled with powder and tied securely round the root of the tail. The edges of the tail are to be made sharp, that they may cut the cover upon discharging the bomb. The cartridge and bomb are to be placed in the cannon and rammed home with a rammer, which has a hole in its end, about two inches in diameter, for the cap to enter. The bomb is then ready to be discharged at the desired object. The end on which the tube is being the heaviest, and the tail being on the other end, keeps the cap forward, which, upon striking, explodes and communicates the fire through the touchhole, by means of the powder contained in it, to

the powder in the area between the two shells; by this time the bomb has entered the object struck, and the outer shell explodes and tears it in pieces; instantly follows the explosion of the inner shell, the outer explosion having communicated the fire to it through the touch-hole I. The explosion of this shell increases the destruction and throws out the sulphured missles on fire. The suffocating smell of the sulphur renders them obnoxious, while they, from their combustible composition, are greatly liable to set fire to any ignitable matter near them. Figure 3 is a single exploding bomb. It is constructed with a tail, similar to the double exploding bomb, and also has a tube and cap similar to it; it contains the sulphured missiles, prepared as heretofore described; is discharged out of a cannon; strikes with the cap foremost, owing to its being thicker and consequently heavier in the front, and also having the tail on the other end. Upon striking, it explodes, is destructive, and throws out the sulphured missiles on fire, which are liable (as in the double exploding bomb) to set fire to any ignitable matter near them. Figure 5 is the flying cannon, the specification of which is in a separate instrument of writing, and is signed by the same witnesses.

WM. W. HUBBELL, *Inventor.*

We, the undersigned, are witnesses to this instrument of writing, this 5th day of December, A. D. 1840.

B. POWELL HOLLINGSWORTH,
*No* 244 *Callowhill street, Philadelphia.*
HENRY T. REES.
CHARLES J. ASHMEAD,
*No.* 322 *North 6th street, Philadelphia.*

DECEMBER 4, 1840.

My claim to these bombs consists of their entire mode of construction and of setting them off by means of a percussion cap. I also claim the mode of constructing the cap and the sulphured missiles; also the powdered sulphur, as the sulphur on the blocks and also the powdered sulphur are placed there by me for the purpose of both rendering them ignitable and to produce a suffocating smoke, so that a person approaching the missiles to extinguish their fire will be liable to suffocation from the sulphurous smell.

WM. W. HUBBELL.

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In the matter of the application of Wm. W. Hubbell to Congress for compensation for the use of his patent explosive shell.

CITY OF PHILADELPHIA, }
*State of Pennsylvania,* } *ss.*

On this the 15th day of March, A. D. 1858, before me, the subscriber, one of the aldermen of the city aforesaid, personally appeared Charles J. Ashmead, who, being duly sworn according to law, deposes and says: That he is personally acquainted with William W. Hubbell, esq., and was in 1840, and that he, said deponent, witnessed the

original of the specification of said Hubbell, of which the within is a certified copy from the Patent Office, and that said original was signed by this deponent as a subscribing witness, as it purports, on the fifth day of December, A. D. eighteen hundred and forty, (December 5, 1840.)

CHARLES J. ASHMEAD.

Sworn and subscribed before me, an alderman in and for the city aforesaid, this 15th day of March, 1858.

PETER CULLIN,
*Alderman and ex officio Justice of the Peace.*

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THE UNITED STATES PATENT OFFICE.

*To all persons to whom these presents shall come, greeting:*

This is to certify, that the annexed is a true copy from the files of this office, of a paper filed in the matter of the application of William W. Hubbell, in accordance with which application letters patent were issued to the said William W. Hubbell, on the twenty-second day of January, eighteen hundred and fifty-six, for an improvement on eccentric explosive shells.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed, this twenty-third day of February, in the year of our Lord one thousand eight hundred and fifty-six, and of the independence of the [L. S.] United States the eightieth.

C. MASON.

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SPECIFICATION.

Fig. 1 is a side view of the exterior of one of the shot. A is the body of the shot; each end is a semi-globe, and the two are connected to a straight-sided cylinder in casting, thus forming a shot greater in length than in breadth, and having a straight side entirely round its circumference, to prevent it from turning as it passes out of the gun; on one end (viz: the front end) is a tube B, with a touchhole extending from its extremity to a chamber inside of the shot. This tube has a percussion cap to fit on it (C) with fulminating powder in the top of it, which must be composed of any of the known substances for such purpose, sufficient to explode by striking against any soft wood. With it, on the other (viz: the back end) of the shot is a tail D, having three or more wings, (four are preferable,) which connect to a neck which screws in an opening through a short neck on this end of the shot, and thus form a neck E sufficiently large to tie the cartridge round, for which purpose it is used.

Fig. 2 is a view of the four wings forming the tail, their relative positions being at right angles with each other. D D D D are the wings.

Fig. 3 is a view showing the interior form and composition of the shot. A A represents the body of the shot; B is the tube, which is on the front end of the shot; H is the touchhole, which is conical and small at the end of the tube, and is larger as it extends from it through a thick body of metal G (which is always in the front to make it the heaviest, and thus likely to go just as desired in being shot) to the chamber or hollow part of the shot. In the hollow part of the shot I place an India rubber or other water tight bag, with a long neck, through the opening I, (which extends through the neck E and thickness of the shot,) and then fill the bag with oil of turpentine, and secure the neck tight. I then fill the chamber through this same opening with dry gunpowder, and screw the tail on, and put a wooden plug in the touchhole, and stow the shot away until it is to be used. It may at this time have the cartridge tied on the tail. When about to charge it in the gun, the plug is pulled out of the tube, and the percussion cap put on it, and the shot is rammed home with a rod having a hole in the end of it to slip over and not touch the cap, which, when rammed home, is always the front part of the charge, or next the muzzle of the gun; and, when shot, this end (viz: with the cap on) comes out of the gun first, goes to the object to be struck first, and, in striking, explodes and communicates its fire to the powder, which bursts the shell, blows the object struck in pieces, and bursts the India rubber bag, and sets its contents on fire, which, being a highly inflammable liquid, spreads on the object so struck a mass of fire in flames.

Fig. 4 is a view showing the interior arrangement of the double exploding rocket. This rocket consists of two shells, one inside of the other; A A is the outer shell and is similar in shape to fig. 1; B is its tube; H is its touchhole, which is intersected at its base by two lower touchholes H H, which are bored on each side of the tube B to intersect the lower part of the touchhole in it, and communicate from it to the space between the shells; G is the body of metal in the front end to make it the heaviest end; nearest the front end in the shell A A, and to the body of metal G, is cast another shell L L, inside of which shell is the bag K to hold the oil of turpentine, with a neck sufficiently long to extend through the opening M in the inner shell, and the opening I in the outer shell, to receive the oil of turpentine and there be tied secure to retain it; in loading or filling the rocket or shot, the gunpowder is first put in the inner shell through the openings I and M, a plug is then screwed in the opening M and extends nearly to the opening I, having a touchhole extending through its centre for about two inches and intersected by another hole bored across and entirely through the plug, thus forming a communication between the chamber of the inner shell and the space between the two shells (or chamber of the outer shell) so that the fire may communicate from one to the other. The chamber of the outer shell is then filled with gunpowder, and the tail screwed fast in the opening I; and, having a bearing against the end of the other plug, to stiffen the back part of the shell, the cartridge is then tied round the neck E; and when the cap is put on the tube, it is loaded and fired the same as the single exploding shot; but, in striking an object, first the outer shell explodes and then

the inner shell explodes and throws out the fire; thus this rocket or shot throws a great body of iron and is consequently more destructive, by its being a double exploding rocket or shot, than the single exploding rocket or shot are.

Fig. 5 is a side view of the exterior of a rocket or shot; A is the body, and B is its tube, which are similar in form and nature to that in figs. 1 2 3, with the tail, instead of being entirely behind the body, consists of three or more wings D D D cast to the body with it. This rocket may be a double exploding rocket with its interior arrangement similar to fig. 4.

Fig. 6 is a side view of the exterior of a rocket or shot; A is the body of the rocket, one end is a semi-globe and is the front end, on which is the tube (B;) it tapers from the semi-globe to the back and smaller end, which is rounding, and on which are cast with it three or more wings D D D. This rocket is heaviest at the front end, and is a single explosive one, and may be a double explosive one by having another shell inside, adjusted similar to fig. 4, but should be like the outer shell in its form; it may be loaded after the cartridge is rammed home, with the cap as the others foregoing are, and explodes in a similar manner to them on striking an object.

Fig. 7 is a side view of the exterior of a rocket or shot having its form round, (or a globe;) A is its body, on the front end of which is the tube B, which has a touchhole extending through its centre, communicating with the chamber inside the shell; on the back end are three or more wings cast on to the shot rocket or shell with it; this shell is a single exploding shell, or it may have another shell inside of it nearest its front end, adjusted and operating similar to fig 4.

It will be observed that each and all of the foregoing described shells, rockets, or shot, although in different shapes, are of a similar nature. They each, one and all, have a tube on the front end, on which is placed a percussion cap, which explodes by striking an object and communicates fire to the powder in the chamber of the shell, which causes it to explode and be destructive. They each have wings (or a tail) on the back end, and the front end of each is made heavier than the back end. Each one may explode once, or, by having one shell inside of another, explode twice; that they are each loaded with the cap towards the muzzle of the gun when rammed home, and each, by being so constructed and arranged, always go with the cap foremost, which strikes first, and, by so striking, brings about the destructive effects of the shell, and, by containing the bag of oil of turpentine, (which they may contain, or be used without,) they throw out fire in flames.

I take my specification as my claim: Each shell rocket or shot, taken altogether as a shell rocket or shot, or any part thereof individually, embracing the having of a tail to the shot; the using of a tube and percussion cap; the two shells, one in the other, for a missile to shoot out of a cannon against an object, and have the missle explode by taking fire from the concussion in striking the object.

WILLIAM WHEELER HUBBELL.

Witnesses:

B. P. HOLLINGSWORTH,
JOHN BINNS.

CITY OF PHILADELPHIA, *ss.*

On this twenty-fourth day of January, 1842, before the subscriber, an alderman of said city, personally appeared William Wheeler Hubbell, of Moyamensing, Philadelphia county, and State of Pennsylvania, and made solemn oath (or affirmation) that he verily believes himself to be the original and first inventor of the mode herein described of constructing shells, rockets, or shot to shoot from cannon, &c., and explode on striking an object; and that he does not know or believe that the same was ever before known or used prior to the invention thereof by himself; and that he is a citizen of the United States.

WILLIAM WHEELER HUBBELL.

Sworn and subscribed, January 24, 1842, before
JOHN BINNS, *Alderman.*

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CITY OF PHILADELPHIA, *ss.*

Benjamin Powell Hollingsworth, of the district of Spring Garden, personally appears before John Binns, an alderman of said city, and, being duly sworn, deposes and says, that William Wheeler Hubbell has made him acquainted with the within described inventions, and that he never will disclose anything whatever of or concerning the same, unless he previously obtains the written consent of said Hubbell to do so.

BENJAMIN POWELL HOLLINGSWORTH.

Sworn and subscribed, January 24, 1842, before
JOHN BINNS, *Alderman.*

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EASTERN DISTRICT OF PENNSYLVANIA, *ss:*

On this the twenty-ninth day of March, A. D. one thousand eight hundred and fifty-three, before me, the subscriber, Charles F. Heazlitt, a United States commissioner, duly appointed by the circuit court of the United States in and for the eastern district of Pennsylvania, personally appeared Benjamin Powell Hollingsworth, who, being duly sworn according to law, did depose and say, as follows: I am forty-six years of age, and reside in the district of Northern Liberties, county of Philadelphia, and am a machinist and pattern maker by trade. I have read and understood the foregoing specification and drawing of an explosive shell, to fire from cannon, invented by William W. Hubbell, and witnessed by me. Many years ago I made a pattern to cast that shape shell, and fitted up castings made from it, Mr. Hubbell's order. The pattern and the shells were precisely the same shape as that described in the foregoing specification. I had my shop in Callowhill street, below Seventh street, at the time. I did considerable work on machinery and on shells for Mr. Hubbell there

in the years 1841, 1842, and 1843. It was in the early part of 1843 that I made the pattern and fitted the shells up like that described for Mr. Hubbell. I am certain it was at that time, and this is the original bill made out by me for the work, at the time of its date, in my own hand writing:

PHILADELPHIA, *February* 17, 1843.

| Mr. WILLIAM W. HUBBELL, to B. P. HOLLINGSWORTH, | Dr. |
|---|---|
| January 7, to pattern and furnishing 5 6-pound shells..... | $11 27 |
| February 17, to material and furnishing 6 32-pound shells... | 16 84 |
| | 28 11 |
| Credit, by amount, as per receipt given..... | 15 00 |
| Balance..... | 13 11 |

The pattern which I made was for the six-pounder shells. I fitted up both six-pounder and thirty-two pounder casting of the same shape. The thirty-two pounders, I understood at the time, were cast at the West Point foundry to Mr. Hubbell's order. He, Mr. Hubbell, was the inventor of the shell, and was making experiments with shells.

B. P. HOLLINGSWORTH.

Sworn to and subscribed before me, at Philadelphia, this 29th day of March, A. D. 1853.

[SEAL.] Witness my hand and seal.

CHAS. F. HEAZLITT,
*United States Commissioner.*

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UNITED STATES NAVY DEPARTMENT, (on account of experiments of shells, authorized to William W. Hubbell, esq.)

| 1842. | To POTTS & JOCOM, | Dr. |
|---|---|---|
| Oct. 22. | For 7 balls, 345 lbs., at 6¼ c..... | $21 56 |
| " 28. | For 6 balls, 252½ lbs., at 6¼ c..... | 15 78 |
| | | 37 34 |
| Oct. 20, 1845, for 3 years' interest on ditto..... | | 6 72 |
| | | 44 06 |

PHILADELPHIA, *October* 20, 1845.

Endorsed on the back, " William W. Hubbell, Esq., Washington, D. C. [Philadelphia, Pa., Oct. 21.]"

THE UNITED STATES PATENT OFFICE.

*To all persons to whom these presents shall come, greeting:*

This is to certify that the annexed is a true copy from the files of this office of a paper filed in the matter of the application of William W. Hubbell, in accordance with which application letters patent were issued to the said William W. Hubbell, on the twenty-second day of January, eighteen hundred and fifty-six, for an improvement on eccentric explosive shells.

In testimony whereof, I, Charles Mason, Commissioner of Patents, have caused the seal of the Patent Office to be hereunto affixed this twenty-third day of February, in the year of our Lord one thousand eight hundred and fifty-six, and of the independence of the United States the eightieth. [L. S.]

C. MASON.

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*In the matter of the application for a patent for improvement in explosive shells, by Wm. W. Hubbell, of Philadelphia, before the commissioner of patents, at Washington.*

SOUTHERN DISTRICT OF NEW YORK, *City of New York,* } *ss.*

On this the sixteenth day of July, A. D. 1855, before me, the subscriber, personally appeared Wm. Kemble, who being duly sworn according to law, deposes and says: I am 59 years of age, and reside in the city of New York, and am agent of West Point Foundry Association, and was, and have been before, during and since the year 1843, and I do testify that on the 13th day of January, 1843, I received from Wm. W. Hubbell, of Philadelphia, the annexed order or original letter now marked "Exhibit A," dated Philadelphia, January 12, 1843, and the drawing of the shell thereto belonging, and referred to therein, marked "Exhibit B," and signed by me; and said shells, according to plan, were cast at the West Point Foundry, and forwarded to Mr. Hubbell at Philadelphia. The writing at the foot of the letter, under date "New York, 13th January, 1843," and signed by me, is in my handwriting, and was made by me at that time on transmitting Mr. Hubbell's order to the foundry.

The letter annexed, marked "Exhibit C," is an original letter written by me at New York, 9th February, 1843, in relation to the six 32-pounder shells ordered January 12, 1843, and which had, before 9th February, 1843, been forwarded to him, as appears by said original letter. The letter marked "Exhibit D" is an original letter ordering six more of the same shells, and referring to others; and the letter annexed, marked "Exhibit E," dated New York, May 1843, is the original letter and bill for six more shells, the same as contained in

the order of 12th January, 1843, forwarded to Mr. Hubbell, at Philadelphia. Commodore Alexander S. Wadsworth recommended me to cast these shells for Mr. Hubbell.

W. KEMBLE.

Sworn to before me this 16th July, 1855.

R. E. STILWELL,
*United States Commissioner.*

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*Exhibit A.*

PHILADELPHIA, *January* 12, 1843.

SIR: The commander of the Philadelphia navy yard requires of you to send that order for the 12 shell-castings, &c., to this office, and also duplicate bills; for the bills to be accepted and returned to you.

Respectfully,

WM. W. HUBBELL.

WM. KEMBLE,
*Agent West Point Foundry Association, New York.*

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*Order.*

PHILADELPHIA, *January* 12, 1843.

Please send to me six 32-pounder shell-castings, cast and in size agreeably to the accompanying drawings, by the Delaware and Raritan canal, and charge the same to me.

WM. W. HUBBELL.

WM. KEMBLE,
*Agent West Point Foundry Association, New York.*

When may I expect a sloop with Mr. Tathom's work, &c.

NEW YORK, *January* 13, 1843.

DEAR SIR: I have this moment received the annexed, which pray execute as soon as possible, and return me the letter with the original order, after taking copy.

Yours truly,

W. KEMBLE.

ROB'T P. PARROTT, Esq.

*Exhibit C.*

NEW YORK, *February* 9, 1843.

DEAR SIR: I have yours of the 7th instant, in relation to the 6 32-pounder shells, forwarded you—the amount is so small that I do not wish to keep our books open, and you will oblige me by paying the amount to Mr. F. G. Smith, 37 South Front street, Philadelphia, whose receipt will be binding.

I annex copy of a letter just received from Captain Engle, from which there appears some misunderstanding; you will oblige me therefore by calling on Captain Engle, and having the bills rendered for the 12 shells sent in the autumn passed, and returned to me for payment—advising me of your having done so.

Yours, respectfully,

WM. KEMBLE,
*Agent of the West Point Foundry Association.*

Mr. W. W. HUBBELL,
72 S. 5*th street*, *Philadelphia.*

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UNITED STATES NAVY YARD,
*Philadelphia, February* 8, 1843.

SIR: A short time since, Mr. Hubbell brought a bill here for approval, for 24 shells of 8-inch, and 6 shells of a smaller size. He (Mr. H.) told me that 12 had been paid for in New York. If such is the fact, no more can be paid for by the government, because Mr. H. was only authorized to have 12 cast at the expense of the government, therefore you will have to look to Mr. Hubbell for payment for any excess over the twelve which I authorized.

I am, very respectfully, your obedient servant,

F. ENGLE, *Commander.*

WM. KEMBLE, Esq., *New York.*

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*Exhibit D.*

PHILADELPHIA, *May* 4, 1843.

SIR: I yesterday called on Mr. Smith, received and paid for the 10 shells, at 5 per cent. off. I wish you to send me 6 32-pounder shells immediately, (as soon as possible,) cast off the same patterns, and in the same manner as those you furnished me to order of 12th January last—I will pay cash for them.

Yours, respectfully,

WM. W. HUBBELL,
72 *S.* 5*th street.*

WM. KEMBLE,
*Agent West Point Foundry Association.*

N. B. It is of much moment to me to have them in a short time; and please ship them to come all the way by canal, as were the last.

W. H. H.

*Exhibit E.*

NEW YORK, *May* 18, 1843.

DEAR SIR: At foot is bill of 6 shells forwarded Mr. Smith, 37 S. Front street, amounting to $8 38, which I have written him you will call and pay, when the bill of lading will be delivered over to you.

I must beg you to understand that in executing these small orders I am governed by a desire to oblige, with a view of inducing further orders, and having charged the rate on extensive orders, trust there will be no further misunderstanding in regard to the price and time of payment, the preparations each time on 6 shells absorb all profit.

Yours respectfully,

WM. KEMBLE,
*Agent of the West Point Foundry Association.*

Mr. W. W. HUBBELL,
72 *S. 5th street, Philadelphia.*

NEW YORK, *May* 16, 1843.

Mr. W. W. HUBBELL,
To the WEST POINT FOUNDRY ASSOCIATION.

| | |
|---|---|
| To 6 shells, 150 lbs. 5c | $7 50 |
| Packing box, 50c, cartage 38c | 88 |
| | 8 38 |

---

NEW YORK NAVY YARD, *December* 5, 1842.

SIR: As the men at Sandy Hook for proving guns are to be withdrawn, I am unable to attend to the further examination of your thunderbolt shells until next spring. I will inform you at Philadelphia as soon as I shall be able to attend to it.

Yours, respectfully,

ALEXANDER S. WADSWORTH.

Mr. WM. W. HUBBELL, *Philadelphia.*

Endorsed on the back: "Mr. Wm. W. Hubbell, South 5th street, Philadelphia. [New York, Dec. 5.]"

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WASHINGTON, *May* 14, 1846.

SIR: Colonel Bomford desires me to say, in reply to your letter to the Secretary of War of the 12th instant, that he will be in Philadelphia by the middle of next week to witness the experiments with your shells.

You will find him at the Franklin Hotel.

Respectfully, your obedient servant,

WM. MAYNADIER,
*Captain of Ordnance.*

WM. W. HUBBELL, Esq., *Philadelphia.*

WASHINGTON, *May* 15, 1846.

SIR: I wrote to you yesterday, by request of Colonel Bomford, saying that he would probably be in Philadelphia by the middle of next week, (the time stated in your letter to the Secretary of War for making your experiments,) and that he would be found at the Franklin Hotel.

Colonel Bomford has this morning received your letter of the 12th instant, and desires that you may be informed that he will be in Philadelphia, if possible, in time to witness the first experiments, and at any rate in time to be present at the second. You may inquire for him at the Franklin Hotel, and if he is not there to see the experiments on Saturday, Lieutenant Dearborn, at Frankford arsenal, might be asked to attend, who could take notes and give Colonel Bomford information in reference to them.

Yours, respectfully,

WM. MAYNADIER,
*Captain of Ordnance.*

P. S.—Colonel Bomford requests that you might wait a day for him, in case he should not be able to be at Philadelphia the day you state, *Thursday of next week.*

WM. W. HUBBELL, Esq.,
*No. 75 South 4th street, Philadelphia.*

Endorsed on the back: "Wm. W. Hubbell, esq., No. 75 South 4th street, Philadelphia, Penn. [Washington, D. C., May 15.]"

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*In the matter of the application of William W. Hubbell to Congress for compensation for the use of his explosive shell castings.*

STATE OF NEW YORK,
*City and County of New York,* } *ss.*

Wentworth S. Butler, of said city, being duly sworn, says: That he is librarian of the New York Society Library, in the city of New York, and, as such, has full charge of the books, documents, publications, and papers belonging to said library at the rooms of said institution, No. 67 University Place, in the city of New York, and has had such charge for several years past.

And deponent further says that said library contains the files of the New York Herald, for the year 1843, bound up consecutively, and that he finds in said files of the New York Herald, for the year 1843, bound up as aforesaid, a number of said Herald purporting to have been issued and published on the 13th day of August, 1843, and bearing that date, which said number of the Herald contains an article entitled or headed "Experiments at Sandy Hook," of which article deponent has made a full and correct copy from said number of the Herald and annexed said copy hereto; and that the paper hereto an-

nexed, marked A, and on which this deponent has written his name in the margin, is a *full, true,* and *correct* copy of said article from the New York Herald of August 13, 1843, and that deponent copied the same from the files of said paper so, as aforesaid, in his charge

WENTWORTH S. BUTLER,
*Librarian N. Y. S. L.*

Sworn to before me this 16th day of March, 1858.

THOS. MACFARLAN,
*Commissioner of Deeds.*

*Paper marked A, referred to in the foregoing affidavit and making part of the same.*

A.

"EXPERIMENTS AT SANDY HOOK."

"On Thursday last one of Mr. Hubbell's thunder bombs, fired by an eight pound cartridge from a 32-pounder gun at this gun-practice station, exploded the instant of impact, midway in a target the thickness of the side of a line-of-battle-ship, 1,050 yards distant, and tore it in thousands of pieces, blowing some of them 110 feet from the target. A piece weighing 150 pounds was blown 60 feet distant. The destruction extended ten feet lengthways of the timber of the target, and a board target lying on the ground 30 feet distant was also much shattered to pieces by it. Also, one of the 242 lb. balls was fired from the immense wrought iron gun with great precision."

WENTWORTH S. BUTLER.

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COMMANDANT'S OFFICE UNITED STATES NAVY YARD,
*Philadelphia, May* 5, 1843.

SIR: I transmit herewith a report made by Lieut. William A. Wurts, who was directed to accompany Mr. Hubble to witness some experiments made with the "thunderbolt shell."

The experiments were made at the expense of Mr. Hubble, who has requested me to forward the report, that you might become acquainted with the result.

I am, very respectfully, your obedient servant,

GEORGE C. READ.

Com. WILLIAM M. CRANE,
*Chief of the Bureau of Ordnance, &c., Washington, D. C.*

PHILADELPHIA NAVY YARD,
*May* 5, 1843.

SIR: I have the honor to enclose a report by Lieut. W. A. Wurts, who was present, by my order, at the firing of three of Mr. Hubbell's "thunderbolt shells."

Respectfully, sir, your obedient servant,
P. ENGLE, *Commandant.*

Com. GEORGE C. READ,
*Commanding Navy Yard, &c., Philadelphia.*

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NAVY YARD, PHILADELPHIA,
*April* 27, 1843.

SIR: In compliance with your instructions, I was present at the experiments made with Mr. Wm. Wheeler Hubbell's "thunderbolt shells," between the hours of 11 and 2 o'clock this day, about half a mile below this yard. The following is a statement of the result: Three six-pounder cannon "thunderbolt shells,'" each weighing 4½ pounds, were fired from a six-pounder carronade, obtained from this yard, at a target 8 feet long by 7 feet 7 inches, and 12 inches thick—2¾ inches of the thickness being oak and 9¼ inches hemlock; distant about 90 yards, and standing upright on three floating hemlock logs. The two first shells passed through the target, splintering with effect of solid shot, and immediately, or within six feet, exploded, driving fragments of the shell in every direction. The explosion was evidently the effect of concussion and friction in passing through the target. Eleven places are counted in the logs cut by the pieces of the exploded "thunderbolt shell," which, occupying but a small part of the courses, for the pieces of the "thunderbolt shell" to take effect upon, gives reason to believe that they bursted into a great many pieces, and, from the appearance of the logs, with great explosive power. The last "thunderbolt shell" missed the target, and bounded along over the water, I should judge, nearly a mile, when, having nearly spent its force, and not having received concussion or friction on the target to cause explosion, it exploded on a reserve, which Mr. Hubbell informs me existed in all the "thunderbolt shells" for such an event.

From the position in which the shells which struck the target exploded, it is highly probable that the explosion of the "thunderbolt shell," after passing through a ship's side, will take place immediately over the deck, and by its explosive power, do great damage in every direction.

Mr. Hubbell informs me that he considers the above experiment with the "thunderbolt shell" entirely successful, and that he can also prepare them to explode at the time of passing into a ship's side, for the especial purpose, in conjunction with the kind used in action, of immediately dismantling and sinking a vessel.

The cartridges prepared by Mr. Hubbell were one pound, but on

BUREAU OF ORDNANCE AND HYDROGRAPHY,
*March* 17, 1858.

SIR: In compliance with your directions, endorsed upon the letter to the department from the Hon. Thomas B. Florence, of the House of Representatives, I have the honor to transmit herewith sketches showing a section of 12 and 24-pounder shrapnel. (There is no such calibre as 6-pounder in the navy.) Mr. Florence's letter is herewith returned.

I am, sir, very respectfully, your obedient servant,

D. N. INGRAHAM,
*Chief of the Bureau.*

HON. ISAAC TOUCEY,
*Secretary of the Navy.*

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HOUSE OF REPRESENTATIVES, *March* 16, 1858.

SIR: On behalf of the Committee on Naval Affairs, in the investigation of the claim of W. W. Hubbell, esq., for the use of his patent shell casting, referred to me, you are respectfully requested to furnish me with a copy of the order of August 22, 1842, issued to Commodore Alexander S. Wadsworth, to try or examine his shells.

Also a copy of the order issued at the same time to the Philadelphia navy yard, authorizing their preparation or trial.

Likewise, information to the following requests or inquiries from the ordnance is asked:

1. To send me a full size drawing in section of the 8-inch shell casting, used or made in 1841, and inform whether the neck or reinforce of the same was used with a *wooden* fuse stock to fit in a conical opening through the thickness of the reinforce.

2. To send also a *full* size drawing in section of the 8-inch shell casting, with the flat-based or plain reinforce around the fuse, and inform whether the same was or is used in the service with a *metallic bush* and *fuse stock?*

3. To inform what number of shells with this flat-based or plain reinforce around the fuse *have been cast since* 1843 for the service of *all sizes*, including shrapnels, as near as may be estimated. A general estimate will suffice.

4. What number of these shells, with *flat-based* or plain reinforce around the fuse hole, of all sizes, are *now on hand* in the naval depots, vessels, and foundries of the service, including shrapnel shell castings? A general estimate being sufficient.

Very respectfully, your obedient servant,

THOMAS B. FLORENCE.

HON. ISAAC TOUCEY,
*Secretary of the Navy.*

NAVY DEPARTMENT,
*April* 5, 1858.

SIR: I have the honor to acknowledge the receipt of your letter of the 16th ultimo, desiring, on behalf of the Committee on Naval Affairs, certain information in connexion with Mr. W. W. Hubbell's shells.

The enclosed copy of a letter, dated the 2d instant, from the chief of the Bureau of Ordnance and Hydrography, and the copies of letters and the drawings accompanying it, will furnish the information asked for in your letter, excepting answers to the third and fourth questions, which cannot be readily given.

I am, very respectfully, your obedient servant,

I. TOUCEY.

Hon. THOS. B. FLORENCE,
*Committee on Naval Affairs, House of Reps.*

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BUREAU OF ORDNANCE AND HYDROGRAPHY,
*April* 2, 1858.

SIR: In compliance with the request contained in the letter to the department from the Hon. Thomas B. Florence, of the Naval Committee of the House of Representatives, I have the honor to transmit herewith copy of an order from the late Board of Navy Commissioners, dated August 22, 1842, to Commodore Alexander S. Wadsworth, to make experiments with thirty-two-pounder "thunderbolt shells," invented by Mr. William W. Hubbell. Also, copy of an order, of the same date, to the commandant of the navy yard at Philadelphia, to afford Commodore Wadsworth facilities for making the experiments.

A drawing of the eight-inch shell which was used in the navy in 1841, with a wooden fuse, and a drawing of the eight-inch shell adopted in October, 1846, and intended for the use of Mr. Alger's paper fuse, are also enclosed, The eight-inch shells now used in the navy have a metallic bush and fuse stock, which have been in use since the year 1847.

A satisfactory reply to the third and fourth inquiries in the letter from the Hon. Mr. Florence cannot be made, at this time, with the present clerical force of the bureau. I would also remark, that there is a large correspondence on the files of this office in relation to Mr. Hubbell's "thunderbolt shells," copies of which can be furnished, if deemed necessary by the Committee on Naval Affairs.

Mr. Florence's letter is herewith returned.

I have the honor to be, sir, with great respect, your obd't servant,

D. N. INGRAHAM,
*Chief of the Bureau.*

Hon. ISAAC TOUCEY,
*Secretary of the Navy.*

NAVY COMMISSIONER'S OFFICE,
*August* 22, 1842.

SIR: The commissioners have received your letter of the 16th inst. transmitting the communication of Mr. Hubbell respecting his "thunderbolt shells," and the Secretary of the Navy having authorized an experiment to be made with those shells, if it can be done without too much cost, the board have instructed Com. Wadsworth, now in New York, to attend to the proposed experiment when convenient. You will be pleased, therefore, to afford him such facilities as he may require in making the experiment.

The expense is chargeable to the appropriation of $50,000 for experiments, &c., being part of $600,000 appropriated by act of Congress approved September 11, 1841.

Respectfully, &c.,

W. M. CRANE,
*For the Board of Navy Commissioners.*

Com. GEORGE C. READ,
*Commandant Navy Yard, Philadelphia.*

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NAVY COMMISSIONER'S OFFICE,
*August* 22, 1842.

SIR: The commissioners transmit herewith copies of letters from Commander Engle and Mr. Wm. W. Hubbell in relation to certain experiments with the 32-pounder thunderbolt shells, invented by the latter, which he is desirous should be made, and which the Secretary has authorized, if it can be done without too much cost.

You will, therefore, be pleased to attend to this matter when your convenience will enable you to do so, reporting the result, with your opinion also, to the board. The shells are at Philadelphia, and Com. Read has been directed to afford you such facility as you may require in making the experiments authorized.

Respectfully, &c.,

L. WARRINGTON,
*For the Board of Navy Commissioners.*

Com. A. S. WADSWORTH, *Washington.*

¶

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 122.

# HALF-PAY TO OFFICERS OF THE REVOLUTIONARY WAR.

## RESOLUTION

OF

## THE LEGISLATURE OF THE STATE OF VIRGINIA,

FOR THE

*Final settlement of the half-pay to officers of the revolutianary war.*

APRIL 21, 1858.

A RESOLUTION for the final settlement of half-pay to officers of the revolutionary war, adopted by the general assemby March 25, 1858.

Whereas the resolutions of the continental Congress of the 21st of October, 1780, January the 7th, 1781, and March the 8th, 1785, promised half-pay for life to the officers of the revolutionary army who should serve to the end of the war, or until the time of their reduction;

And whereas the commutation certificates issued after the war in lieu of said half-pay were greatly depreciated in value, so that the engagements of Congress to the said officers have not been fully discharged;

*Resolved*, That our senators in Congress be instructed, and our representatives requested, to advocate and vote for any bill now before Congress, or which may hereafter be introduced, providing for the final settlement and payment of the half-pay promised by the resolutions aforesaid, and that the governor of this commonwealth be requested to transmit to each of our senators and representatives in Congress a copy of this preamble and resolution.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 123.

# THE DRED SCOTT DECISION.

## RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF MASSACHUSETTS,

IN RELATION TO

*The decision of the Supreme Court in the case of Scott* versus *Sanford.*

APRIL 21, 1858.—Ordered to be printed.

COMMONWEALTH OF MASSACHUSETTS.

IN THE YEAR ONE THOUSAND EIGHT HUNDRED AND FIFTY-EIGHT.

RESOLUTIONS in relation to the decision of the Supreme Court of the United States in case of Scott *versus* Sanford.

*Resolved*, That while the people of Massachusetts recognize the rightful judicial authority of the Supreme Court of the United States in the determination of all questions properly coming before it, they will never consent that their rights shall be impaired, or their liberties invaded, by reason of any usurpations of political power by said tribunal.

*Resolved*, That slavery does not and cannot exist in the Commonwealth of Massachusetts.

*Resolved*, That all citizens of Massachussetts are citizens of the United States; that all negroes, not aliens, domiciled within her limits, are citizens of Massachusetts, and are entitled to all the rights, privileges, and immunities of citizenship in the courts of the United States and elsewhere.

*Resolved*, That no part of the decision of the Supreme Court of the United States, in the case of Scott *versus* Sanford, is binding, which was not necessary to the determination of that case.

*Resolved*, That in said case there was no cause for the inquiry, on the part of the Court, into the constitutionality of the act of Congress of March sixth, eighteen hundred and twenty, known as the Missouri

Compromise, whereby slavery north of thirty-six degrees thirty minutes, in the territory acquired from France, was forever prohibited; that we hold said act to have been constitutional and valid; and that its repeal was unwise, a gross breach of faith, and the source of unmingled injustice and wrong.

*Resolved*, That slavery can exist nowhere, except by positive law; while freedom is the natural condition of man.

*Resolved*, That we regard the doctrine that the Constitution of the United States protects and maintains slavery in the Territories as unfounded, monstrous, and a palpable contradiction, since the preamble to that instrument declares that it was formed to "secure the blessings of liberty," not the curse of slavery, "to the people of the United States and their posterity."

*Resolved*, That Massachusetts is unalterably opposed to any extension of the slave territory of the United States, and to any increase of slave representation in Congress by the admission of new States.

*Resolved*, That his excellency the governor be requested to transmit a copy of these resolutions to the President of the United States, to the governors of each of the States and Territories, and to each of our senators and representatives in Congress.

HOUSE OF REPRESENTATIVES, *March* 27, 1858.

Passed.

JULIUS ROCKWELL,
*Speaker.*

IN SENATE, *March* 27, 1858.

Passed.

CHARLES W. UPHAM,
*President.*

*March* 27, 1858.

Approved.

NATH'L P. BANKS.

SECRETARY'S OFFICE,
*Boston, April* 9, 1858.

I hereby certify the foregoing to be a true copy of the original resolutions.

Attest:

OLIVER WARNER,
*Secretary of the Commonwealth.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 124.

# KANSAS.

APRIL 21, 1858.—Ordered to be printed.

# RESOLUTIONS

OF

# THE COMMONWEALTH OF MASSACHUSETTS,

IN RELATION TO

*The admission of Kansas.*

COMMONWEALTH OF MASSACHUSETTS.

IN THE YEAR ONE THOUSAND EIGHT HUNDRED AND FIFTY-EIGHT.

RESOLVES in relation to the admission of Kansas.

*Whereas*, The President of the United States has recently transmitted the Lecompton constitution to Congress, with a message recommending its ratification by that body, and there is reason to fear that it may be so ratified; and

*Whereas*, The aforesaid Lecompton constitution was framed by a convention which was the embodiment and consummation of a series of violent, usurping, and fraudulent acts, by which the people of Kansas had been despoiled of the right of self-government for more than three years—the members of that convention being chosen and convoked by a minority of the people, through the instrumentality of fraud, violence, and official misconduct; and

*Whereas*, The people of Kansas, at a legally authorized election, holden on the fourth day of January, eighteen hundred and fifty-eight, rejected the aforesaid Lecompton constitution by a majority of more than ten thousand votes; and

*Whereas*, It is entirely within the power of Congress to reject the said Lecompton constitution, or to ratify a constitution which has received the approval of the people of Kansas, or to authorize them to form a constitution under such conditions as Congress may prescribe; therefore—

*Resolved*, That in the judgment of the Commonwealth of Massachusetts, the proposed ratification of the Lecomption constitution would be an endorsement by Congress of the oppression and outrages

which have been practised in Kansas, in the highest degree disgraceful to the national government, a breach of the national faith solemnly pledged to the Territory in her organic act, an abuse of the power of Congress, and a flagrant violation of the fundamental principles of republican freedom.

*Resolved*, That as all government derives all its just powers from the will of the governed, as all political sovereignty resides in the people, and as the will of the majority is the ultimate and supreme power in the State—therefore, to force a constitution upon the people of Kansas, not only without their assent, but against their expressed will, would be treason against the principles of our institutions, a denial of the political faith of the framers of our Constitution, and an act of tyranny which admits of no defence or palliation.

*Resolved*, That Massachusetts contemplates with dismay so grave a departure from those principles of popular self-government, of which this nation stands as the exemplar to the world—principles on which the liberties of this Commonwealth and her sister States depend, and that she raises her voice with no common alarm and indignation in solemn remonstrance against the act.

*Resolved*, That our senators be instructed, and our representatives in Congress be requested, to oppose all attempts to force upon the people of Kansas a constitution against their assent.

*Resolved*, That his excellency the governor be requested to transmit a copy of the foregoing preamble and resolves to each of the senators and representatives of this State in Congress.

HOUSE OF REPRESENTATIVES, *March* 27, 1858.

Passed.

JULIUS ROCKWELL, *Speaker.*

IN SENATE, *March* 27, 1858.

Passed.

CHARLES W. UPHAM, *President.*

MARCH 27, 1858.

Approved.

NATHANIEL P. BANKS.

SECRETARY'S OFFICE, BOSTON, *April* 9, 1858.

I hereby certify the foregoing to be a true copy of the original resolves.

OLIVER WARNER,
*Secretary of the Commonwealth.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 125.

# KANSAS—LECOMPTON CONSTITUTION.

## RESOLUTION

OF THE

## LEGISLATURE OF THE STATE OF WISCONSIN,

RELATIVE TO

*The Lecompton Constitution.*

APRIL 22, 1858.

JOINT RESOLUTION relative to the Lecompton constitution.

*Resolved by the people of the State of Wisconsin represented in senate and assembly, first*, That Congress has no power by the Constitution, or of common right, to create a State or form a constitution for any people without their consent, and that any attempt to exercise such power should be regarded as a dangerous innovation, alike subversive of the fundamental principles upon which our national institutions rest and of the declaration contained in the charter of our national liberties—that all governments derive their just powers from the consent of the governed.

*Second.* That the people of this State do solemnly protest against the passage of any act or resolution by Congress introducing or admitting Kansas into the federal Union as one of the States thereof, under the instrument commonly denominated the Lecompton constitution, or under any constitution which shall not have been first submitted, as a whole, to a fair vote of the people thereof, and have been by them ratified and approved.

*Third.* That they are alike opposed to the passage of any act providing for the formation of a constitutional convention in the Territory of Kansas, unless said act shall provide for just apportionment of delegates to said convention, based upon the number of inhabitants in said Territory, and the election of such delegates by a fair vote of the resident people; and unless provision is made in said act for a submission of any constitution which may be formed, in all its parts, as a whole, to a fair vote of the people for their acceptance or rejection.

*Fourth.* That the passage of any act or resolution, in the nature of

a compromise or otherwise, whereby the admission of Kansas as a State is made a condition to the admission of any other newly formed State, or to the organization of any new Territory, would be a violation of right and of the principles of just government.

*Resolved*, That the governor be requested to forward a copy of the foregoing resolution to each of the senators and representatives in Congress for this State, to be by them laid before Congress.

F. S. LOVELL,
*Speaker of the Assembly.*

H. H. GILES,
*President of the Senate pro tem.*

Approved April 15, 1858.

ALEX. W. RANDALL.

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STATE OF WISCONSIN, } ss.
*Secretary's Office.*

The secretary of state of the State of Wisconsin does hereby certify that the foregoing joint resolution has been compared with the original enrolled resolution filed in this office, and that the same is a true and correct copy thereof, and of the whole of such original.

In witness whereof, I have hereunto set my hand and affixed the great seal of the State, at the capitol, in Madison, this 16th day of April, A. D. 1858. [L. S.]

J. D. RUGGLES,
*Assistant Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 126.

# LIEUTENANT MAURY.

## RESOLUTIONS

OF THE

## LEGISLATURE OF THE STATE OF NEW YORK,

ASKING

*For the promotion of Lieutenant Maury.*

APRIL 27, 1858.—Referred to the Committee on Naval Affairs.

STATE OF NEW YORK,
*In Assembly, April* 14, 1858.

On motion of Mr. Fullerton, the following preamble and resolutions were adopted:

Whereas Lieutenant Maury, of the United States navy, having, by his unwearied industry and the application of his vast scientific skill, made discoveries respecting the winds and currents, which furnish additional security to ocean navigation, add to the protection of commerce, and contribute to enhance our commercial character and greatness as a people, has entitled himself to the thanks of his countrymen, and to honorable advancement and promotion:

*Therefore, (if the senate concur,) be it resolved,* That our senators and representatives in Congress be, and they are hereby, requested to use all honorable means to obtain the promotion of Lieutenant Maury to such rank in the navy as his eminent services and merits entitle him to.

*And be it further resolved,* That his excellency the governor be, and he hereby is, requested to forward a copy of these resolutions to each of our said senators and representatives.

By order: D. WILSON, *Clerk.*

IN SENATE, *April* 15, 1858.

Concurred in without amendment.

By order: S. P. ALLEN, *Clerk.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 127.

# CHANGE IN THE ARMY UNIFORM.

## LETTER

FROM

## THE SECRETARY OF WAR,

IN REFERENCE TO

*The recent change in the army uniform, &c.*

MAY 4, 1858.—Referred to the Committee of Ways and Means.

WAR DEPARTMENT,
*Washington, April* 30, 1858.

SIR: I have the honor to acknowledge the receipt of your letter of the 28th instant, asking the necessity for the recent change in the army uniform and the legal authority for making the same.

In consequence of repeated representations by many officers of the army of the entire unsuitableness of the old uniform cap, a board was directed to convene, composed of officers of experience in the service, to consider the propriety of a change in this respect, as well as in others of minor importance in which improvements were thought desirable. After a full consideration of the subject, the board recommended certain modifications of the established uniform, which are fully described in the enclosed printed order, urging their adoption as necessary for the comfort of the troops, and desirable on account of the greater neatness and simplicity which they would impart to the soldiers' dress. The old uniform cap was represented as utterly unsuited for the service, affording little or no protection to the soldier, exposing him unnecessarily to scorching suns, to drenching rains, and cold and sweeping winds, and adding to the unavoidable hardships of active service one which could readily be obviated by the use of a felt hat such as has now been adopted. So apparent, indeed, was the necessity for a change in this respect, that it is well known to the department that the soldiers themselves, finding the cap which was provided by the government useless for the only purpose for which a cap is used, as a covering for the head and a protection for the face and neck. have in many instances abandoned it and provided them-

selves with hats at their own expense. The only other change which affects in any important degree the estimate for army clothing is in the color of the pants, dark blue having been substituted for a lighter shade of the same color. This alteration, while it adds not a little to the appearance of the uniform, opens a wider range of selection in the purchase of the material; and will thus, in all probability, by inviting competition, enable the department to procure a better article at a cheaper rate. So that this change, though involving an increased expenditure at the outset to inaugurate it, will be in reality a measure of true economy in the end.

The legal authority for the change is found in article 100, section 1, of the act of April 10, 1806, "establishing rules and articles for the government of the armies of the United States," which gives the President power "to prescribe the uniform of the army."

Very respectfully, your obedient servant,

JOHN B. FLOYD,
*Secretary of War.*

Hon. J. GLANCY JONES,
*Chairman Com. Ways and Means, H. R.*

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GENERAL ORDERS No. 3.

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
*Washington, March* 24, 1858.

The following regulations have been received from the War Department, and are published for the information and guidance of the army:

I. Instead of the uniform cap prescribed by existing regulations, all corps of the army will wear a hat of the pattern hereinafter described:

HAT.

*For officers:* Of best black felt. The dimensions of medium size to be as follows:

Width of brim, 3¼ inches.
Height of crown, 6¼ inches.
Oval of tip, ½ inch.
Taper of crown, ¾ inch.
Curve of head, ⅜ inch.

The binding to be ½ inch deep, of the best black ribbed silk.

*For enlisted men:* Of black felt, same shape and size as for officers, with double row of stitching, instead of binding, around the edge. To agree in quality with the pattern deposited in the clothing arsenal.

TRIMMINGS.

*For general officers:* Gold cord, with acorn-shaped ends. The brim of the hat looped up on the right side, and fastened with an eagle attached to the side of the hat; three black ostrich feathers on the

left side; a gold embroidered wreath in front, on black velvet ground, encircling the letters U. S. in silver, old English characters.

*For officers of the Adjutant General's, Inspector General's, Quartermaster's, Subsistence, Medical and Pay departments, and the Judge Advocate, above the rank of captain:* The same as for general officers, except the cord, which will be of black silk and gold.

*For the same departments, below the rank of field officers:* The same as for field officers, except that there will be but two feathers.

*For officers of the corps of engineers:* The same as for the general staff, except the ornament in front, which will be a gold embroidered wreath of laurel and palm, encircling the silver turreted shield on black velvet ground.

*For officers of the topographical engineers:* The same as for the general staff, except the ornament in front, which will be a gold embroidered wreath of oak leaves, encircling a gold embroidered shield, on black velvet ground.

*For officers of the ordnance department:* The same as for the general staff, except the ornament in front, which will be a gold embroidered shell and flame, on black velvet ground.

*For officers of dragoons:* The same as for the general staff, except the ornament in front, which will be two gold embroidered sabres crossed, edges upward, on black velvet ground, with the number of the regiment in silver in the upper angle.

*For officers of cavalry:* The same as for the dragoons, except that the sabres will be reversed, with the number of the regiment in the lower angle.

*For officers of mounted riflemen:* The same as for the general staff, except the ornament in front, which will be a gold embroidered trumpet, perpendicular, on black velvet ground.

*For officers of artillery:* The same as for the general staff, except the ornament in front, which will be gold embroidered cross-cannon, on black velvet ground, with the number of the regiment in silver at the intersection of the cross-cannon: The brim of the hat to be looped up on the left side, and the feathers worn on the right side.

*For officers of infantry:* The same as for artillery, except the ornament in front, which will be a gold embroidered bugle, on black velvet ground, with the number of the regiment in silver within the bend.

*For enlisted men:* The same as for officers of the respective corps; except that there will be but one feather, the cord will be of worsted, and the badges of yellow metal. The letter of the company, of yellow metal, to be worn in front.

All the trimmings of the hat are to be made so that they can be detached; but the eagle, badge of corps, and letter of company, are to be always worn.

A cocked hat, as prescribed in the General Regulations of 1847, may be worn by general and field officers at their option. Except for the general-in-chief, three black ostrich feathers will be worn with the cocked hat, instead of a plume.

2. The uniforn trowsers for both officers and enlisted men will be of dark blue cloth, made without plaits. A gold cord one-eighth of an inch in diameter, instead of a buff welt, will be worn by officers of

the general staff and staff corps, and a sky-blue welt by officers of infantry; for other corps the welt at present worn. For sergeants a stripe one and a half inch wide, and for corporals a stripe half an inch wide, of the color of the facings for the corps, will be worn covering the outer seam.

3. In lieu of one of the two coats or jackets now authorized the first, third, and fifth years, and of the sky-blue cloth jacket allowed by paragraph 1402, General Regulations, two sacks of blue flannel, of the pattern issued to mounted troops, will be allowed yearly to all enlisted men.

4. The uniform coat will be made without plaits, and the number of the regiment will be omitted from the collar of the coat.

5. Instead of the common tent now in use, the pattern known as Sibley's tent will be substituted.

6. This regulation is to go into effect immediately, except that the clothing and tents of the old pattern now on hand will be issued until exhausted.

II. Paragraph 1003, General Regulations for the Army, is amended by adding the following:

The inspectors general, when on tours of inspection where they are obliged to take a servant, shall be entitled to the actual cost of his transportation.

III. Paragraph 963 of the Regulations for the Army is so far amended as to allow to the senior ordnance officer stationed at the headquarters of a military department, one room as an office, and fuel therefor, from the 1st October to the 30th April, at the rate of one cord of wood per month.

IV. Fort Umpqua, Oregon Territory, is announced as a double ration post, and will be considered as such from the date of its occupation.

By order of the Secretary of War:

S. COOPER,
*Adjutant General.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 128.

# OCEAN MAIL SERVICE, &c.

[To accompany Bill H. R. No. 558.]

## LETTER

FROM

## THE POSTMASTER GENERAL,

IN REFERENCE TO

*The transportation of the United States mail by ocean steamers, &c.*

MAY 10, 1858.

POST OFFICE DEPARTMENT,
*April* 21, 1858.

SIR: Under the authority conferred by the 1st section of the "Act to provide for the transportation of the mail between the United States and foreign countries, and for other purposes," approved March 3, 1845, Statutes, vol. v, p. 748, this department has deemed it essential to the public interest to cause the United States mails to be carried from New York to Liverpool by other than contract steamers whenever the regular contract mail steamers have not been in place to perform the service at the proper time; and for such service the parties performing it have agreed to receive, as full compensation, the amounts of sea postage on the mails transported by them respectively. Temporary service of this kind has frequently been employed, as I shall show more particularly in another place, to carry the mails which should have been taken on their regular sailing days by the Collins steamers; and, as the service on that line appears to be entirely suspended, I deem it my duty to ask that provision be made out of the appropriation granted by the act of March 3, 1857, Statutes, 3d session, 34th Congress, p. 248,) for the "transportation of the mails from New York to Liverpool and back," for defraying, out of the treasury, the expenses already incurred, as well as those which will be incurred in keeping up on our part during the current

fiscal year regular post intercourse between New York and Liverpool. These expenses, thus far, amount to $16,757 70, to wit:

| | |
|---|---|
| Steamer Alps, from New York, February 14, 1857 | $4,642 40 |
| Steamer Alps, from New York, April 11, 1857 | 3,183 32 |
| Steamer Edinburg, from New York, February 13, 1858 | 3,057 24 |
| Steamer New York, from New York, March 13, 1858 | 3,134 23 |
| Steamer City of Baltimore, from New York, April 10, 1858 | 2,740 51 |
| Amount ascertained | 16,757 70 |

The foregoing is for mails outward only, but in future it is intended to arrange for voyages out and back; and if the public be assured that vessels will be despatched so as to alternate with the British mail steamers from New York, it is probable that the amount of mail matter sent by them will be considerably greater than has been carried on the outward trips already made. Should this prove to be correct, and should the department succeed in procuring suitable steamships to transport the mails out and back for the sea postages, then it is estimated that the further sum of $35,000 will be required to perform the remaining trips set for the Collins line within the present fiscal year, to wit: April 24, May 8 and 22, and June 5 and 19, 1858, five trips, at $7,000 per round trip.

I submit herewith the draught of such an amendment as appears to me to be required to carry out the objects before stated to the end of the present fiscal year.

I have the honor to be, most respectfully,

AARON V. BROWN,
*Postmaster General.*

Hon. J. GLANCY JONES,
*Chairman Committee Ways and Means, House of Reps.*

# LIST OF BOOKS REMOVED FROM THE BASEMENT OF THE CAPITOL.

MAY 10, 1858.—Referred to the Committee on the Library and ordered to be printed.

*List of books in room No. 37, south wing.*

| | |
|---|---|
| 7 copies of Reports of Committees, 1839–'40 | 7 |
| 48 copies of Executive Documents, 1840–'41 | 48 |
| 17 copies of Executive Documents, 1841–'42. | |
| 10 copies of Senate Documents, 1841–'42. | |
| 17 copies of Reports of Committees, 1841–'42. | |
| 9 copies of House Journal, 1841–'42 | 53 |
| 24 copies of Executive Documents, 1842–'43. | |
| 25 copies of Senate Documents, 1842–'43 | 49 |
| 7 copies of Senate Documents, 1843–'44 | 7 |
| 13 copies of Executive Documents, 1844–'45 | 13 |
| 518 copies of Executive Documents, 1845–'46. | |
| 172 copies of Senate Documents, 1845–'46. | |
| 2 copies of Senate Journal, 1845–'46. | |
| 151 copies of Reports of Committees, 1845–'46. | |
| 54 copies of House Journal, 1845–'46 | 897 |
| 9 copies of Executive Documents, 1847–'48. | |
| 16 copies of Senate Documents, 1847–'48. | |
| 4 copies of Reports of Committees, 1847–'48 | 29 |
| 23 copies of Executive Documents, 1848–'49. | |
| 11 copies of Senate Documents, 1848–'49 | 34 |
| 357 copies of Executive Documents, 1849–'50. | |
| 317 copies of Senate Documents, 1849–'50. | |
| 44 copies of Senate Miscellaneous, 1849–'50. | |
| 8 copies of House Miscellaneous, 1849–'50. | |
| 40 copies of House Journal, 1849–'50 | 766 |
| 716 copies of Executive Documents, 1850–'51. | |
| 261 copies of Senate Documents, 1850–'51. | |
| 10 copies of Senate Miscellaneous, 1850–'51. | |
| 10 copies of Senate Journal, 1850–'51. | |
| 26 copies of House Journal, 1850–'51 | 1,023 |
| 1,286 copies of Executive Documents, 1851–'52. | |
| 122 copies of Senate Documents, 1851–'52. | |
| 9 copies of Senate Miscellaneous, 1851–'52. | |
| 10 copies of Senate Reports, 1851–'52. | |
| 10 copies of Senate Journal, 1851–'52. | |
| 10 copies of Reports of Committees, 1851–'52. | |
| 10 copies of House Miscellaneous, 1851–'52. | |
| 5 copies of House Journal, 1851–'52 | 1,462 |

1,106 copies of Executive Documents, 1852–'53.
394 copies of Senate Documents, 1852–'53.
32 copies of Senate Reports, 1852–'53.
56 copies of Senate Journal, 1852–'53.
37 copies of Senate Miscellaneous, 1852–'53.
114 copies of Reports of Committees, 1852–'53.
60 copies of House Journal, 1852–'53.
89 copies of House Miscellaneous, 1852–'53.
13 copies of Miscellaneous Documents..... 1,801
1,744 copies of Executive Documents, 1853–'54.
455 copies of Senate Documents, 1853–'54.
121 copies of Senate Reports, 1853–'54.
32 copies of Senate Journal, 1853–'54.
126 copies of Senate Miscellaneous, 1853–'54.
218 copies of Reports of Committees, 1853–'54.
91 copies of House Journal, 1853–'54.
88 copies of House Miscellaneous, 1853–'54 ..... 2,875
1,323 copies of Executive Documents, 1854–'55.
351 copies of Senate Documents, 1854–'55.
89 copies of Reports of Committees, 1854–'55.
43 copies of Senate Miscellaneous, 1854–'55.
74 copies of Senate Journal, 1854–'55.
72 copies of House Miscellaneous, 1854–55.
60 copies of House Journal, 1854–'55.
53 copies of Senate Reports, 1854–'55..... 2,065
10 copies of Executive Documents, 1855–'56.
238 copies of Senate Documents, 1855–'56.
198 copies of House Journal, 1855–'56.
30 copies of Senate Miscellaneous, 1855–'56..... 476
3,346 copies of Miscellaneous Documents, Executive, Senate, &c. 3,346
1,022 copies of Miscellaneous Pamphlet, Executive, Senate, &c. 1,022
319 copies of Pitkins' State Papers, &c..... 319
390 copies of Official Register, 1816–'18–'20..... 390

*Quarto volumes.*

98 copies marked volume 6, 1854–'55—Coast Survey Report, 1854.
48 copies marked volume 12, 1854–'55—Coast Survey Report, 1854..... 146
49 copies marked volume 13, 1853–'54—Coast Survey Report, 1853.
90 copies marked volume 4, 1853–'54—Coast Survey Report, 1853 ..... 139
50 copies marked volume 11, 1853–'54—Coast Survey Report, 1852.
95 copies marked volume 8, 1853–'54—Coast Survey Report, 1852 ..... 145
34 copies marked volume 15, part 1—Gilliss' Abstract, volume 1.

| | |
|---|---|
| 19 copies marked volume 15, part 2—Gilliss' Abstract, volume 2. | |
| 12 copies marked volume 12, part 3—Gilliss' Abstract, volume 3 | 65 |
| 33 copies marked volume 18, 1856—Mortality Army | 33 |
| 4 copies marked volume 12, part 1—Japan Expedition, volume 1. | |
| 26 copies marked volume 14, part 3—Japan Expedition, volume 3. | |
| 39 copies marked volume 12, part 3—Japan Expedition, volume 3 | 69 |
| 19 copies marked volume 13, part 1—Pacific Railroad, volume 1. | |
| 50 copies marked volume 11, part 1—Pacific Railroad, volume 1 | 69 |
| 67 copies of Census Report, 1830 | 67 |
| 200 copies of Comp. Census, 1840, (unbound) | 200 |

*Folio volumes.*

| | |
|---|---|
| 469 copies of Digest of Manufactures, 1823. | |
| 141 copies of Receipts and Expenditures, 1823. | |
| 63 copies of Hydrographical Report. | |
| 97 copies of newspaper files | 770 |
| 848 copies of Statutes at Large, volumes 1 to 8. | |
| 180 copies of Statutes at Large, miscellaneous volumes | 1,028 |
| 3,054 copies of the Laws of the United States, miscellaneous volumes. | |
| 523 copies of Laws of the United States, volumes 1 to 10. | |
| 20 copies of Laws of the United States, 1843–'44. | |
| 20 copies of Laws of the United States, 1844–'45. | |
| 140 copies of Laws of the United States, 1846–'47. | |
| 113 copies of Laws of the United States, 1848–'49 | 3,870 |

*John Adams' works.*

| | |
|---|---|
| 376 copies of volume 2. | |
| 379 copies of volume 3. | |
| 420 copies of volume 4. | |
| 407 copies of volume 5. | |
| 397 copies of volume 6. | |
| 382 copies of volume 7. | |
| 398 copies of volume 8 | 2,759 |

*French, Latin, and English books.*

461 copies of quarto volumes, French and Latin.
134 copies of quarto volumes, pamphlets, Latin.
117 copies of folio volumes, French and English.
455 copies of octavo volumes, French and Latin.

269 copies of octavo volumes, pamphlets, French..... 1,49
11 copies of Gallery de Versailles, volumes 1, 2, 3, 4, 5, 7, 9, 10, 11, 12, 13, (volumes 6 and 8 missing).....

27,5

*Lot of French Engravings.*

4 boxes charts.
39 maps.
Lot of blank books, custom-house affairs, New York city.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 130.

# ESTIMATES—PAY FOR THREE REGIMENTS VOLUNTEERS, PER ACT APPROVED APRIL 7, 1858.

[To accompany Bill H. R. No. 561.]

## LETTER

FROM

## THE SECRETARY OF WAR,

TRANSMITTING

*Estimates for three regiments of volunteers.*

MAY 11, 1858.

WAR DEPARTMENT, *Washington, May* 7, 1858.

SIR: I have the honor to submit herewith, for the consideration and action of the Committee of Ways and Means, estimates of funds necessary to be appropriated for the three regiments of mounted volunteers authorized by an act of Congress approved April 7, 1858, to serve for a period of twelve or eighteen months.

Very respectfully, your obedient servant,

JOHN B. FLOYD,
*Secretary of War.*

Hon. J. G. JONES,
*Chairman Com. Ways and Means, Ho. of Reps.*

*Estimates of the expense of the three regiments of volunteers for eighteen months.*

| | | |
|---|---|---|
| Quartermaster's department | | $2,701,779 49 |
| Subsistence department | | 516,544 80 |
| Pay department | | 1,565,407 00 |
| Ordnance department | | 166,780 85 |
| | | 4,950,512 14 |
| Deduct six months for— | | |
| Subsistence | $172,495 80 | |
| Pay | 488,469 00 | |
| | | 660,964 80 |
| | | 4,289,547 34 |

QUARTERMASTER GENERAL'S OFFICE,
*Washington City, April* 14, 1858.

SIR: I have the honor to present, in obedience to your instructions, estimates of the probable expense of the three regiments of volunteers authorized by a late act of Congress, for the period of eighteen months, in two separate papers, viz:

Paper A, being an estimate of the probable cost of the various items appertaining to the quartermaster's department proper, including fuel, forage, straw, stationery, incidental expenses, transportation of supplies, and the purchase of means of transportation, with the hire of teamsters and other operatives, amounting together to $2,477,336 47

And paper B, including the cost of clothing, camp and garrison equipage, amounting together to..... 224,443 02

Making for the whole cost through the quartermaster's department..... 2,701,779 49

The details upon which these estimates have been made will be submitted to you so soon as fair copies can be prepared of them. Every item has been carefully calculated; but it is proper to remark that any estimate for so long a period in advance, and for a service covering so great an extent of territory, is at least but a mere approximation to the truth. Favorable circumstances may reduce the expenditures far below the estimates, and other circumstances may swell them greatly beyond present expectations.

I have the honor to be, sir, your obedient servant,

TH. S. JESUP,
*Quartermaster General.*

Hon. JOHN B. FLOYD,
*Secretary of War, Washington, D. C.*

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A.

*Estimate of funds required by the quartermaster's department for the three regiments of mounted volunteers authorized by an act of Congress, approved April* 7, 1858, *to serve for a period of eighteen months; two regiments in Utah, and one regiment on the frontier of Texas*

REGULAR SUPPLIES.

| | | |
|---|---|---|
| Fuel..... | $31,876 75 | |
| Forage..... | 324,953 68 | |
| Straw..... | 2,530 44 | |
| Stationery..... | 786 37 | |
| | | $360,147 [illegible] |

INCIDENTAL EXPENSES.

| | |
|---|---|
| lacksmiths' and shoeing tools, horse and mule s and nails, iron and steel, horse medicines, et ropes, and shoeing horses, &c., | $22,500 00 |

TRANSPORTATION OF SUPPLIES.

| | |
|---|---|
| ansportation of clothing, camp and garrison page, ordnance, subsistence, quartermasters' medical stores, for the purchase of mules and purchase and repair of wagons, and for the of teamsters, &c., | 2,094,689 23 |
| | 2,477,336 47 |

TH. S. JESUP,
*Quartermaster General.*

RTERMASTER GENERAL'S OFFICE,
*Washington April* 14, 1858.

---

B.

*ite of clothing, camp and garrison equipage, with its cost, that be required for the equipment and service of the regiment of nted men for Texas, authorized by the act approved April* 7, 1858.

| | |
|---|---|
| 4 caps, complete, with letters, at $1 68 | $2,862 72 |
| pompons, eagles and rings, at 25 cents | 213 00 |
| cap covers, at 55 cents | 468 60 |
| 4 jackets, with numbers, at $5 56 | 9,474 24 |
| 6 pairs trowsers, at $3 53 | 9,022 68 |
| 6 flannel shirts, at 98 cents | 2,504 88 |
| 6 pairs drawers, at 43 cents | 1,099 08 |
| pairs boots, at $2 79 | 2,377 08 |
| 4 pairs bootees, at $1 80 | 3,067 20 |
| 8 pairs stockings, at 28 cents | 954 24 |
| leather stocks, at 13 cents | 110 76 |
| great coats, at $8 09 | 6,892 68 |
| stable frocks, at 75 cents | 639 00 |
| blouses, at $1 88 | 1,601 76 |
| blankets, at $3 50 | 2,982 00 |
| ashes, at $3 | 36 00 |
| all tents, flies, poles, and pins, at $22 73 | 704 63 |
| ommon tents, poles, and pins, at $19 03 | 1,294 04 |
| spades, at 75 cents | 92 00 |

| | | |
|---|---|---|
| 163 axes and handles, at $1 19 | | $19 |
| 163 hatchets and handles, at 35 cents | | 5 |
| 852 hatchet slings, at 70 cents | | 59 |
| 136 pickaxes and handles, at 83 cents | | 11 |
| 136 camp kettles, at 74 cents | | 10 |
| 340 mess pans, at 30 cents | | 10 |
| 883 bed sacks, at $1 20 | | 1,05 |
| 20 bugles, cords, and tassels, at $5 | | 10 |
| 883 canteens and straps, at 47 cents | | 41 |
| 2 Or. C. S. shoulder scales, pairs, at $1 23 | | |
| 40 sergeants'.....do.....do | 1 03 | 4 |
| 810 privates'.....do.....do | 73 | 59 |
| 2 regimental order books, at $2 25 | | |
| 1.....do..... letter book, at $3 50 | | |
| 1.....do..... descriptive book, at $2 25 | | |
| 11 company clothing account books, at $1 88 | | 2 |
| 10 .....do.....order books | 96 | |
| 10.....do.....morning report books | 1 80 | 1 |
| 11.....do.....descriptive books | 1 80 | 1 |
| About 6 post morning report, at $1 20 | | |
| 6 post guard report, at $1 20 | | |
| 6 post order books, at $1 20 | | |
| 6 post letter books, at $1 20 | | |
| Total | | 49,87 |

The cost for one year being $49,876 23, the cost for the regi for eighteen months may be set down at $74,814 34. This bein cost of one regiment, the estimate for clothing, camp and gar equipage, for the three regiments of volunteers authorized by th approved April 7, 1858, mounted, will be $224,443 02.

TH. S. JESUP,
*Quartermaster Gener*

QUARTERMASTER GENERAL'S OFFICE,
*Washington City, April* 14, 1858.

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OFFICE OF COMMISSARY GENERAL OF SUBSISTENCE,
*Washington, April* 10, 18

SIR: I have the honor to transmit herewith an estimate o probable amount that will be required to subsist three regime volunteers, authorized by act of Congress approved April 7, 185

Most respectfully, your obedient servant,

A. E. SHIRAS
*Captain, Acting C. G.*

Hon. J. B. FLOYD,
*Secretary of War.*

*Estimate of the probable amount that will be required to subsist three regiments of volunteers authorized by act of Congress approved April 7, 1858, under the supposition that one regiment be employed in Texas, and two in Utah, or on that line.*

| | |
|---|---|
| Total probable amount required for one year | $344,049 00 |
| Total probable amount required for six months | 172,495 80 |
| Grand total | 516,544 80 |

*Data upon which this estimate is made.*

| | |
|---|---|
| One regiment for Texas | 852 persons. |
| Two regiments for Utah | 1,780 " |
| Laundresses | 120 " |
| Officers' servants for Utah | 90 " |
| Employés in quartermaster's, and subsistence departments | 300 " |
| Total | 3,142 persons. |

| | |
|---|---|
| 3,142 persons, for 365 days, at 30 cents each, is | $344,049 00 |
| 3,142 persons, for 183 days, at 30 cents each, is | 172,495 80 |
| Grand total | 516,544 80 |

A. E. SHIRAS,
*Captain, Acting C. G. S.*

OFFICE OF COM. GEN. OF SUBSISTENCE,
*Washington, April* 10, 1858.

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PAYMASTER GENERAL'S OFFICE,
*April* 12, 1858.

SIR: In compliance with your circular of the 10th inst., I have the honor to submit herewith an estimate in detail of the amount required for the payment of the three regiments of volunteers authorized by the act of 7th April, 1858, for the period of one year, and also for eighteen months.

The only conjectural item in the estimate is that of travelling allowance, the full amount of which, it is believed, will be required.

I have the honor to be, very respectfully, your obedient servant,

BENJAMIN F. LARNED,
*Paymaster General.*

Hon. J. B. FLOYD,
*Secretary of War.*

*Estimate of amount required for the pay, &c., of the three regiments of mounted volunteers authorized by the act approved April 7, 1858, for one year.*

| | |
|---|---|
| Pay of officers and men, subsistence and forage of officers of the three regiments | $559,350 00 |
| 40 cents per day for use of horses | 401,208 00 |
| 3 surgeons | 6,759 00 |
| 6 assistant surgeons | 8,745 00 |
| 40 cents per day for use of horses for the six assistant surgeons | 876 00 |
| Travelling into and out of service | 100,000 00 |
| Total cost for one year | 1,076,938 00 |

*Estimate of amount required for the additional six months.*

| | |
|---|---|
| Pay of officers and men, subsistence and forage of officers | $279,675 00 |
| 40 cents per day for use of horses | 200,604 00 |
| 3 surgeons | 3,379 50 |
| 6 assistant surgeons | 4,372 50 |
| 40 cents per day for use of horses for the six assistant surgeons | 438 00 |
| Total cost for eighteen months | 1,565,407 00 |

BENJAMIN F. LARNED,
*Paymaster General.*

PAYMASTER GENERAL'S OFFICE,
*April* 12, 1858.

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ORDNANCE OFFICE,
*Washington, April* 30, 1858.

SIR: In accordance with your instructions received yesterday, I enclose herewith an "estimate of the amount required for arms and their appropriate accoutrements (exclusive of horse equipments) for the three regiments of volunteers authorized by the act approved April 7, 1858."

I have the honor to be, sir, your obedient servant,

W. MAYNADIER,
*Capt. of Ord., in charge of Ordnance Bureau.*

Hon. JOHN B. FLOYD,
*Secretary of War.*

*Estimate of the amount required for arms and their appropriate accoutrements (exclusive of horse equipments) for the three regiments of volunteers authorized by the act approved April 7,* 1858.

| | |
|---|---|
| For 2,670 revolving pistols and appendages, at $18 50 each | $49,395 00 |
| For 54 packing boxes for the same, at $4 each | 216 00 |
| For 890 Sharpe's carbines and appendages, at $30 25 each | 26,922 50 |
| For 890 Colt's carbines and appendages, at $32 50 each | 28,925 00 |
| For 178 packing boxes for carbines, at $2 50 each | 445 00 |
| For spare parts for repairs of 4,450 pistols and carbines, at $1 50 each | 6,675 00 |
| For 2,670 sabres, at $8 50 each | 22,695 00 |
| For 89 packing boxes for sabres, at $2 25 each | 200 25 |
| For 2,670 sets of cavalry accoutrements, at $6 28 each | 16,767 60 |
| For 54 packing boxes for accoutrements, at $2 25 each | 121 50 |
| For 801,000 cartridges, at $18 per 1,000 | 14,418 00 |
| Total | 166,780 85 |

W. MAYNADIER,
*Capt. of Ord., in charge of Ord. Bureau.*

ORDNANCE OFFICE,
*April* 30, 1858.

CONGRESS, } HOUSE OF REPRESENTATIVES. { MIS. DOC.
Session. } { No. 131.

# SHIP CANAL—FALLS OF NIAGARA.

## RESOLUTIONS

OF THE

## EGISLATURE OF THE STATE OF WISCONSIN.

IN RELATION TO

*The ship canal around the Falls of Niagara.*

MAY 11, 1858.—Referred to the Select Committee on the Ship Canal.

UTIONS in relation to a ship canal around the Falls of Niagara, in the State of New York.

ereas the adoption of every just and legal measure that tends to the cost of transportation between the west and the east, gives iblic a more speedy access to eastern and foreign markets, en- the value of our staples, and lessens the cost of those articles essity and luxury which we do not produce, but derive from l, is eminently desired by this legislature; and whereas the ob- ion which the Falls of Niagara offers to the passage of vessels ur northwestern lakes to Lake Ontario, the St. Lawrence river, ence to our cities on the seaboard, and the commercial marts of rld, causes the cost of transportation between the west and the be materially greater than it would be, were that obstruction ed or avoided; and whereas the construction of a ship canal on ritory of the United States around said Falls of Niagara, of ent size to pass vessels of one thousand tons burden, would en- e flour, wheat, corn, pork, and beef of Wisconsin to be shipped ern markets or direct to Europe without breaking bulk and at greatly below what they are now subjected to; and whereas ship canal would always give to the United States a complete l of the great lakes in case of war between them and Great Brit- d thus be the means of protection to the commerce of the lakes e cities bordering their shores, which could only be had under nt circumstances by keeping up heavy naval armaments on the and lower lakes; and whereas a charter has been granted to a ny, by an act of the legislature of the State of New York, to ct a ship canal, of a capacity as above mentioned, but cannot d with an enterprise of such magnitude, and which will neces-

sarily for some some years afford but a small per cent. upon the capital required, without the aid of the national government; and whereas the granting of such aid is not incompatible with the action of the government in other cases, among which is the grant of lands equal to the entire cost of the construction of a ship canal to connect Lakes Superior and Huron, in the territory of the State of Michigan, therefore—

*Resolved by the senate and assembly of the State of Wisconsin, each house concurring*, That our senators in the United States Congress be instructed, and our representatives requested, to vote for such a grant of the public lands as may be deemed just and necessary to aid in constructing and completing, at an early day as may be practicable, a ship canal around the Falls of Niagara, in accordance with the act of the legislature of the State of New York, upon that subject, passed July 21, 1853.

*Resolved*, That a copy of these resolutions be transmitted by the governor of this State to each of our senators and representatives in Congress.

F. S. LOVEL,
*Speaker of the Assembly.*
E. D. CAMPBELL,
*Lieut. Governor and President of the Senate.*

Approved May 1, 1858.

ALEX. H. RANDALL.

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STATE OF WISCONSIN, } ss.
*Secretary's office,*

The secretary of state of the State of Wisconsin does hereby certify that the foregoing memorial has been compared with the original memorial filed in this office, and that the same is a true and correct copy thereof, and of the whole of such original.

In witness whereof, I have hereunto set my hand and affixed the great seal of the State, at the capitol, in Madison, this fourth day of May, A. D. 1858. [L. S.]

J. D. RUGGLES,
*Assistant Secretary of State.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 132.

# PUBLIC BUILDINGS IN NEW MEXICO.

[To accompany Bills H. R. Nos. 173 and 174.]

## LETTER

FROM

## THE SECRETARY OF THE TREASURY,

TRANSMITTING

*A report in reference to the condition of public buildings in New Mexico.*

MAY 13, 1858.

TREASURY DEPARTMENT,
*Office of Construction, Washington, D. C.,*
*January* 23, 1858.

SIR: Herewith I transmit, agreeably to your verbal request, copies of the report of J. Houghton, superintendent of the public buildings in the Territory of New Mexico, to Governor Rencher, on the condition of these buildings, and of Governor Rencher's letter transmitting the report.

I am, very respectfully, your obedient servant,

HOWELL COBB,
*Secretary of the Treasury.*

Hon. MIGUEL OTERO,
*House of Representatives, Washington, D. C.*

EXECUTIVE DEPARTMENT,
*Santa Fé, November* 30, 1857.

SIR: I have the honor herewith to enclose you a communication from the superintendent of public buildings in this Territory, containing a statement of the present condition of the state-house and penitentiary, and an estimate of the amount necessary to their completion

I concur entirely with the superintendent in the great importance of an early appropriation to complete these buildings, especially the

feet, and contains 875 cubic yards of masonry. The plan requires a wall on this foundation 16 feet high and 4 feet thick, either adobes or stone. The specification was for adobes, but a subsequent correspondence between the commissioner and the department left it optional with him to make use of either material.

The masonry of a block containing sixteen cells, one large common cell, and an underground arched prison, has been completed, the doors made for the cells and put in their places, and only require the hinges, fastenings, and sheet iron linings to render them ready for use. Placed on the top of these cells is the frame work put up, but not covered, of a common eating room.

The outer walls of the cells are 2½ feet thick, the division walls 20 inches, the floors of closely-fitting blocks of limestone 18 inches thick, the crevices filled with grout.

*Estimate for completion.*—Assuming the outer wall to be built of adobes, it will be as follows:

| | |
|---|---|
| Cost of 140,000 adobes, at $10 | $1,400 00 |
| Cost of transportation, $5 | 700 00 |
| Construction of wall | 4,500 00 |
| Main gates and corral | 800 00 |
| Workshops | 600 00 |
| The keeper's house outside main wall, of adobes | 2,500 00 |
| To finish cells and superstructure | 1,500 00 |
| | 12,000 00 |

| | |
|---|---|
| The outer wall built of stone. Estimate, 1,840 cubic yards masonry, at $10 per cubic yard | $18,000 |
| Other items, as above | 5,400 |
| | 23,400 |

Such would be about the difference between adobes and stone masonry for the outer wall of the penitentiary.

In durability, of course, stone has vastly the preference. Such an adobe wall as above referred to, standing exposed upon both sides, would be subject to incessant wear from the elements, and constantly need repair. A well constructed wall of stone of same dimensions would stand unaffected for centuries.

I would further suggest that the present number of cells and apartments for prisoners will be entirely inadequate to confine the number of prisoners that will be presented. Another block, containing a like number of cells, should be erected. To effect this, would add about $10,000 to the estimate, making the one $22,000, the other $33,400. I trust the latter sum will be appropriated, as you are fully aware of the necessity of an extensive and secure prison in this Territory.

All of which is respectfully submitted.

Respectfully, your obedient servant,

J. HOUGHTON,
*Superintendent Public Buildings.*

ABRAHAM RENCHER,
*Governor Territory of New Mexico.*

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 133.

# FORT SNELLING AS A MILITARY DEPOT.

## REPORT

OF A

## BOARD OF OFFICERS OF THE ARMY,

AS TO

*The necessity of maintaining Fort Snelling as a Military depot.*

MAY 18, 1858.—Ordered to be printed.

*Proceedings of a board of officers which convened at Fort Snelling, Minnesota, by virtue of the following order, viz:*

SPECIAL ORDERS No. 1.

FORT SNELLING, MINNESOTA,
*April* 28, 1858.

By direction of the War Department the following named officers will convene and form a board at Fort Snelling, Minnesota, on the 28th day of April, 1858, at 12 o'clock m., or as soon thereafter as practicable, to examine into and report upon the necessity, advantage, or disadvantage, of maintaining Fort Snelling, as a military depot, for the purpose of supplying any military stations that are now or may hereafter be established in the country to the north and west of that post; also, to report as to the necessity of maintaining a garrison at Fort Snelling to repel Indian incursions, viz:

1st. Brevet Brigadier General W. S. Harney, colonel 2d dragoons.
2d. Lieutenant Colonel J. E. Johnston, 1st cavalry.
3d. Major N. C. Macrae, 3d infantry.
4th. Brevet Major W. W. Chapman, captain quartermaster dep't.
5th. Captain A. A. Humphreys, corps of topographical engineers.
5th. Captain A. Pleasonton, 2d dragoons.

Brevet Major T. W. Sherman, captain 3d artillery, after reporting to Brevet Brigadier General Harney, upon his arrival at St. Louis, Missouri, in accordance with his instructions, will take his place as a member of the board.

By order of General Harney.

A. PLEASONTON,
*Capt. 2d Dragoons, A. A. Adj. General.*

FORT SNELLING, MINNESOTA,
*April* 28, 1858.

The board met pursuant to the above order. The following named officers being present, viz:

1st. General Harney.
2d. Lieutenant Colonel Johnston.
3d. Major N. C. Macrae.
4th. Major W. W. Chapman.
5th. Captain A. A. Humphreys.
6th. Captain A. Pleasonton.

The board were occupied during the 28th, 29th, and 30th, days of April in collecting information as regards "the necessity, advantage, or disadvantage, of maintaining Fort Snelling, as a military depot, for the purpose of supplying any military stations that are now or may hereafter be established in the country to the north and west of that post;" and, "also, the necessity of maintaining a garrison at Fort Snelling to repel Indian incursions," after which the board adjourned to meet at St. Louis, Missouri.

ST. LOUIS, MISSOURI,
*May* 4, 1858.

The board met pursuant to adjournment. The following named officers being present, viz:

1st. General Harney.
2d. Lieutenant Colonel Johnston.
3d. Major Macrae.
4th. Major Chapman.
5th. Major Sherman.
6th. Captain Humphreys.
7th. Captain Pleasonton.

The board, after a careful examination of all the information obtained at Fort Snelling, report the following facts bearing upon the subject to be investigated.

The condition of the frontier to the north and west of Fort Snelling was ascertained to be as follows:

A line from the post of Fort Ripley to the post of Fort Ridgely marks the frontier to the north and west of Fort Snelling.

Fort Ripley, on the Mississippi river, one hundred and twenty-five miles by the road, above Fort Snelling, and Fort Ridgely, on the Minnesota river, about one hundred miles by the road, above Fort Snelling, are the only military stations now within the country above designated. These posts are the limits of settlement to the north and west of Fort Snelling. The only Indian tribes from which this frontier has to be protected are the Chippewas, who occupy the country to the north of Fort Ripley, and the Mississippi Sioux, whose country is west of Fort Ridgely.

The Winnebagoes, established on a reservation to the southeast of Fort Ridgely, are completely controlled by the settlements which surround them.

These two posts, Ripley and Ridgely, are adequate, in the opinion of the board, to satisfy all the requirements to be made at this time for the safety of this frontier; and it is not probable that any large increase in the number of posts or troops will become necessary at any future period.

Fort Snelling, at the junction of the Mississippi and Minnesota rivers, surrounded by the towns of St. Paul, St. Anthony, Minneapolis, and Mendota, being only six miles above St. Paul and about seven miles below St. Anthony, with over one hundred miles to the frontier, its garrison connot promptly and efficiently contribute to repel Indian incursions, while its presence on the frontier would tend to prevent them.

The town of St. Paul is the head of ordinary navigation upon the Mississippi river, and supplies cannot at all times reach Fort Snelling without transhipment. Above the falls of St. Anthony, small steamers ply as far as the Sauk rapids, within forty miles of Fort Ripley. The Minnesota river is navigable for boats of light draught, in favorable stages of water, to Fort Ridgely.

There is a good prairie road on the east side of the Mississippi river, from St. Paul, Fort Snelling, and St. Anthony to Fort Ripley, and also one from the same localities and Minneopolis to Fort Ridgely.

The resources of Minnesota are sufficient to meet all the demands which the government will ever be called upon to make in that quarter for the transportation of troops and supplies, and at a very reasonable cost.

The board is satisfied that the town of St. Paul, being the head of ordinary navigation on the Mississippi, would be the most suitable point of deposit and transhipment for the posts on the frontier to the north and west. By establishing a depot of supplies at Fort Snelling the expense of an additional shipment would often be incurred, to say nothing of other material disadvantages arising from its locality, that will involve a loss of time and additional expense. The cost of maintaining a depot at Fort Snelling will be at least five times as great as the expense of forwarding supplies through St. Paul to the frontier. The duties of the subsistence and quartermaster departments, in the receiving, purchasing, and forwarding of supplies, being mostly of a commercial character, the experience of service has proved it more expedient to use the business facilities of commercial places for these purposes than to establish depots at military stations in their vicinity.

The board respectfully suggest the entire abandonment of Fort Snelling, both as a military station and depot, and the establishment of an agency at St. Paul to forward the necessary supplies to the posts on the frontier by means of private transportation. This method of supply by private transportation, which was used here for several years, proved to be the most economical to the government, and is the mode by which the quartermaster's department supply, generally, the numerous posts established on the whole of our extensive frontier.

The board is unanimous in the opinion expressed in these proceedings.

There being no further business before it, the board adjourned *sine die.*

WM. S. HARNEY,
*Col. 2d Dragoons, Brevet. Brig. General,*
*President of the Board.*

A. PLEASANTON, *Capt. 2d Dragoons,*
*Recorder of the Board.*

5TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 134.

# MILITARY RESERVE AT FORT SNELLING.

## SUNDRY PETITIONS

OF

## CITIZENS OF THE TERRITORY OF MINNESOTA,

PROTESTING

*Against the annulling of the sale of Fort Snelling Reserve, &c.*

MAY 18, 1858.—Ordered to be printed.

*To the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort will be made by the present Congress to set aside and annul the sale of the military reservation at Fort Snelling, recently made by the Secretary of War, beg leave to protest against such action of Congress, and to submit a statement regarding said sale, expressive of our views thereon.

Fort Snelling, in our opinion, is no longer needed as a military post, or as a protection to the frontier, from the fact that it is in the centre of the state, and surrounded on every side by towns and advancing settlements, and its further occupation as such would only retard the settlement of the country in which its lands are located.

We are familiar with the lands of this reservation, and of the value of lands generally in the west, and do not believe that a higher price than $11 per acre could be obtained for said land, sold in any manner; or that it is worth more for any purpose whatever.

We believe that the price paid by the purchaser at such sale was adequate and ample; and trust, for the settlement and improvement of the country, that the sale will be accepted and confirmed:

| | |
|---|---|
| John Banfill | J. B. Ellison |
| John C. Harmon | James McCauley |
| Jas. L. Brown | Charles More |
| B. F. Brown | Henry Woodward |
| A. Hoger | E. P. Filkins |
| B. Cleaver | C. R. Rice |
| J. A. West | Richard Slater |
| John H. Seimers | John Taylor |
| T. W. Betton | J. P. Dignan |
| Edward Carlin | William Boles |
| J. Krainbreng | James O. Prince |

C. B. Potter
Wilber Brownell
J. Casey.
Abram Allen
George Fuller
Benjamin C. Borden
P. E. Wortendyke
Hance Brown
William Creighton
J. F. Gear
N. Gibbs
D. A. Young
Charles J. D. Miller
P. Daum
Samuel Rand
John McDermott
S. D. Henderson
J. H. Varney.

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*To the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort will be made by the present Congress to set aside and annul the sale of the military reserve at Fort Snelling, recently made by the Secretary of War, beg leave to protest against such action of Congress, and to submit a statement concerning the same, expressive of our views thereon.

Fort Snelling, in our opinion, is no longer needed as a military post, or as a protection to the frontier, for the reason that it is situated in nearly the centre of the State, and surrounded on every side by towns and advancing settlements We are familiar with the location of the reserve, and of the quality and value of the land; and consider that the price paid by the purchaser at said sale, to wit: $11 per acre, is more than equal to the value of the lands, or than they would have brought if sold in any other manner.

The further occupation of this reserve as a military post, would only retard the growth and settlement of the country, and we trust that the sale will be confirmed.

W. R. Wood
Walton Cubley
James W. Wood
Jno. G. Watmough, jr
W. B. Farrell
Timothy Fitch
Robert A. Smith
Jno. Penmen,
*Judge of Probate. of Ramsey Co.,*
William S. Combs
Heinrich Wedelstaedt
J. H. Studdiford
Charles S. Chase,
*Acting Governor of Minnesota*
James Mills,
*United States Collector, and Inspector of Customs*
Edward Steenan,
*Register of Deeds for Ramsey Co.,*
F. Somers
F. D. Somers
Oscar King
Francis McNamee
C. G. Miller
O. Nelson
W. J. Williford
H. C. Coates
Wm. H. Brock
W. Coates
Jos. Clarke
S. S. Ellton,
*Justice of the Peace, Ramsey Co.,*
M. C. Tuttle
Theodore Brup
S. R. Champlain
M. H. Miller
Amable Ducfort
Wm. Constans

James Starkey,
*Member of House of Representatives*
J. W. Kerr
W. Sternes
W. F. Gandal.
L. W. Freeman
Spirich Hadley
W. H. Dunbar
Jno. B. Cook
Wm. H. Stillman
Wm. H. Curran
W. B. Mead
Jas. Gooding
John Sharpe
William Spencer.

---

*'o the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort ill be made by the present Congress to set aside and annul the sale ' the military reservation at Fort Snelling, recently made by the ecretary of War, beg leave to protest against such action of Con- ·ess, and to submit a statement regarding said sale, expressive of our ews thereon.

Fort Snelling, in our opinion, is no longer needed as a military st, or as a protection to the frontier, from the fact that it is in the ntre of the State, and surrounded on every side by towns and ad- ıncing settlements, and its further occupation as such would only tard the settlement of the country in which its lands are located.

We are familiar with the lands of this reservation, and of the value lands generally in the west, and do not believe that a higher price an $11 per acre could be obtained for said land, sold in any manner, that it is worth more for any purpose whatever.

We believe that the price paid by the purchaser at such sale was lequate and ample, and trust, for the settlement and improvement of e country, that the sale will be accepted and confirmed.

R. G. Murphy, *P. of Senate*
Geo. H. Phillips,
*Postmaster, Shakopee*
John H. Coulthard
Robert Kennedy, *merchant*
Philip Jacobs.
William Dowd, *farmer*
D. A. Huntsman.
Wm. H. Anderson
W. T. Swanwick
T. J. Duff
David Hodges
Nelson King
T. A. Holmes
Comfort Barnes
Henry Nicbergaly
R. M. Wright
W. Chr. Kooh
Denis McLaughlin
Oscar Lowe
William O. Brown
S. B. Allen
Edsel Grover
W. H. St. Clair
Henry Lesh
Levy Lovenstein
Victor Henkey, *farmer*
George Weple
Joseph Webor
Casper Humpfer
Charles Hartman, jr.
N. McDruemeillon
Henry Hinds, *attorney at law*
Josiah B. Weiser, M. D
Chas. Phinestead
Alexander J. McCauley

Hammond Faller
C. A. Fraser
R. C. Gale, *real estate agent*
Josiah Yale
Benjamin Scribner, jr
Frank Warner, *att'y at law*
J. B. Reynolds
Geo. H. Gleason, *com. merch't.*
W. R. Coller
W. Maijaus
Benn Kohler
C. S. Claus
James S. Craig
Everson Reider
Wm. H. Gibson
B. E. Leibby
Jas. Douglas
Ren. Ashley
Lear Carison
Ben. Enresey
W. B. Hunt, *attorney at law*
Johannes Muller
Geo. Fuller, *merchant.*

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*To the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort will be made by the present Congress to set aside and annul the sale of the military reservation at Fort Snelling, recently made by the Secretary of War, beg leave to protest against such action of Congress, and to submit a statement regarding said sale expressive of our views thereon.

Fort Snelling, in our opinion, is no longer needed as a military post, or as a protection to the frontier, from the fact that it is in the centre of the State, and surrounded on every side by towns and advancing settlements; and its further occupation as such would only retard the settlement of the country in which its lands are located.

We are familiar with the lands of this reservation, and of the value of lands generally in the west, and do not believe that a higher price than $11 per acre could be obtained for said land, sold in any manner, or that it is worth more for any purpose whatever.

We believe that the price paid by the purchaser at such sale was adequate and ample; and trust, for the settlement and improvement of the country, that the sale will be accepted and confirmed.

Chas. E. Flawdrau,
*Associate Justice S. C., M. T.*
W. B. Gerse,
*U. S. Marshal for Minnesota.*
E. S. Julien Cox,
*Dist. Att'y. for Nicoleet county.*
John Johnston
Caleb Holhorse
J. Hennard
William Barnes
Henry M. Slade
James Hinds
*Dist. Att'y. for 6th jud. dist., M.*
E. Pierce
P. Morison
S. M. Bordman
*Sheriff Nicoleet county.*
T. M. Perry,
*Cleveland Leader.*
S. M. Burns
Sandford B. Cocks,
*Clerk U. S. D. C., 3d District.*
W. Lochren
M. Emiory
George H. Raught
Thomas Cowan,
*State Senator, 17th Sen. district.*
Geo. Hezlep

James J. Green
John L. Howes
James P. Smith
Joel B. Kennedy
G. W. Spencer
Jacob Henningway
Charles E. Smith
A. Naylor
E. Woolsey
Jason Raymond
Richard Thompson
C. O. Neill
Charles R. Wood
Joseph A. Estel
Benjamin F. Paul
John Bond
William Wilkinson
Bruner Merevest
Joseph Mason
Isaac A Norwood
James Lamb
John McCarthy
Frederick Schimmet
Henry J. Dane
Robert Brusker.

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*b the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort ill be made by the present Congress to set aside and annul the sale the military reservation at Fort Snelling, recently made by the cretary of War, beg leave to protest against such action of Coness, and to submit a statement regarding said sale, expressive of our ews thereon.

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We are familiar with the lands of this reservation, and of the value lands generally in the west, and do not believe that a higher price an $11 per acre could be obtained for said land, in the aggregate, ld in any manner, or that it is worth more for any purpose whater.

We believe that the price paid by the purchaser at such sale was equate and ample, and trust, for the settlement and improvement of e country, that the sale will be accepted and confirmed.

H. H. Sibley,
*vernor elect of State of Minnesota*
C. H. Berry,
*torney General elect* "
C. H. Emerson, *Surveyor Gen'l*
C. S. Cave, *State Senator*
S. E. Adams, *State Senator*
Wm. A. Davis,
*Ex-Representative*
J. J. Noah,
*Clerk of the Supreme Court*
M. W. Irwin,
*Late United States Marshal*
Geo. H. Ingraham, jr., *Notary*
James Davenport, *bookseller*
Stephen Long, *Fuller House*
A. V. Glahn, *broker*
P. J. Grimes
S. J. Albright,
*Ass't Clerk House of Representatives*
Jno. Farrington, *merchant*
Wm. Sprigg Hall,
*State Senator*
Henry N. Setzer
Wm. R. Bowes
Wm. F. Wheeler

Charles D. Elfelt
John S. Prince,
*Real estate and lumber merchant*
N. W. Kittson
Patrick Nash, *contractor*
B. F. Tillotson,
*Receiver of U. Land Office, Faribault*
Eh. Pettjohn,
*Lumbering business*
Charles H. Oakes, *banker*
T. B. Galusha
J. Rhingston
Clement Beaulieu, jr., *banker*
P. Heffernan
D. F. Bramly
T. Berzfeld
Wm. C. Gray, *land agent*
Geo. W. Hamilton
W. G. de Hesdemuz
H H. Shafer
L. Blinn
N. Killson, jr.
L. A. Des Rosiers
Wilbur M. Heyward
Andrew Levering,
*Real estate agent*
W. H. Acker, *merchant*
Robert Mason
D. Lowth
Wm. T. Iglehart,
*Attorney at law*
J. D. Murray
Howard Lindsley, *land agent*
Charles St. Clair
Edward Davis
John B. Olivier
S. Williams Nelson,
*Attorney at law*
T. L. Fitch
H. G. Brown, jr.
Geo. E. French
Samuel Elby, M. D.
A. B. Brackeld
James F. Roach, *Indian trader*
H. H. Western
A. J. Sypher
James Egan
M. D. Sproat
Emanuel Good
Morgan L. Sproat
Joseph Thornton
E. M. Cooley
Daniel Good, esq.
John McCardle
George W. Craig
P. D. Andreon
J. Flynn
Jeremiah Daly
Raphael Fonten
Michael Hann
Teneau Danteman
David Volleux
Francis Donely
Henry Kleine
Thomas Birmingham
Lanimif Tadiski
William Hagerman
John Herden
Samuel Slougganborg
Gottlob Weekwerth
Friedrik Kruse
Edward Walther
Samuel Snow
Martin Penska
Foxe Schietz
——— B. Gumppel
Bened. Hippber
Joseph Brin
John T. Walker
Benj. Stinson
C. B. Smith
J. P. Paine
J. M. Warner
R. Warner
John Hyland
David Bartley, *merchant*
R. West McLeod, *merchant*
D. Hance McLeod
L. B. Morrow
Thomas Cornell
John R. Filson
James Philipsen, jr.
Wm. Smith.

*o the Senate and House of Representatives of the United States:*

We, the undersigned citizens of Minnesota, learning that an effort ill be made by the present Congress to set aside and annul the sale the military reserve at Fort Snelling, recently made by the Secretary War, beg leave to protest against such action of Congress, and to ıbmit a statement concerning the same, expressive of our views ıereon.

Fort Snelling, in our opinion, is no longer needed as a military ɔst, or as a protection to the frontier, for the reason that it is situated ı nearly the centre of the State, and surrounded on every side by ›wns and advancing settlements. We are familiar with the location this reserve, and of the quality and value of the lands, and consider ıat the price paid by the purchaser at said sale, to wit: $11 per ɜre, is more than equal to its value, or than it would have brought if ›ld in any other manner. The further occupation of this reserve as military post would only retard the growth and settlement of the ›untry, and we trust that the sale will be confirmed.

B. Webster Morse
Jno. H. Martin
R. C. Wiley
Geo. C. Mott
J. E. Martin
A. C. Jones
Alex. Buchanan
P. O'Brien
A. H. Green
E. A. Durel
David Stuart
Wm. H. Nobles
W. N. Dunham
James Dixon
William Draper, *merchant*
John Sutherly
John W. Crosby
D. S. Thompson
Wm. Owen Bokee
Wm. H. Wolff
Geo. B. Holmes
Alfred P. Elfelt
Henry Morris
August Newnert
Chas. Ward
Joseph Brown
Ole. Birkiem
Wm. Hollinshead
Geo. H. Ingraham, jr.
Wm. Trowbridge
E. A. C. Hatch
Ross Wilkinson
John H. Gillis
Albert Caldwell
Albert C. Eddy
Samuel Wigfall
L. H. Eddy
E. D. Mortimer
S. J. Buchanan
Geo. Plunkett
Geo. L. Otis
John W. Schwoar
Wm. M. Buchanan, jr
Samuel S. Smoot
J. K. King
Jno. C. Terry
J. D. Wilson
A. G. Bristine
Jos. Elfelt.

We, the undersigned citizens of Minnesota, learning that an effort will be made by the present Congress to set aside and annul the sale of the military reservation of Fort Snelling, recently made by the Secretary of War, beg leave to protest against such action of Congress, and to submit a statement regarding said sale, expressive of our views thereon.

Fort Snelling, in our opinion, is no longer needed as a military post, or as a protection to the frontier, from the fact that it is in the centre of the State, and surrounded on every side by towns and advancing settlements; and its further occupation as such would only retard the settlement of the country in which its lands are located.

We are familiar with the lands of this reservation, and of the value of lands generally in the west, and do not believe that a higher price than $11 per acre could be obtained for said land sold in any manner, or that it is worth more for any purpose whatever.

We believe that the price paid by the purchaser at such sale was adequate and ample, and trust, for the settlement and improvement of the country, that the sale will be accepted and confirmed.

F. R. Desano.
S. S. Murdock.
Wm. H. Moner.
Isaac Green.
M. H. Abbott, *Rec. Pub. Moneys.*
Thos. Wagner, *Reg. L'd Office.*
Mahlon Black.
W. Holcombe, *Lieut. Governor.*
Francis J. Smith.
Wm. McKusick.
Robert Simpson.
W. C. Johnson.
J. E. McKusick.
Theo. E. Parker.
J. W. Lynde.
Joseph R. Brown.
J. W. Babcock.
Everett O. Foss.
A. J. Myrick.
E. M. McCook.
Mehaffey & Black, *Com. Merch.*
M. Lunton.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 135.

# ANNUAL REPORT

OF THE

# BOARD OF REGENTS

OF THE

# SMITHSONIAN INSTITUTION,

SHOWING THE

## OPERATIONS, EXPENDITURES, AND CONDITION OF THE INSTITUTION FOR THE YEAR 1857.

WASHINGTON:
JAMES B. STEEDMAN, PRINTER.
1858.

# LETTER

OF THE

# SECRETARY OF THE SMITHSONIAN INSTITUTION,

COMMUNICATING

*he Annual Report of the operations, expenditures, and condition of the Smithsonian Institution for the year* 1857.

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MAY 27, 1858.

JUNE 12, 1858.—*Resolved*, That there be printed of the Report on the Condition of the ithsonian Institution, seven thousand copies; five thousand copies for the use of the mem- rs of the House of Representatives, and two thousand for the use of the Institution.

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SMITHSONIAN INSTITUTION,
*Washington, May* 26, 1858.

SIR: In behalf of the Board of Regents, I have the honor to submit the Senate of the United States the Annual Report of the opera- ns, expenditures, and condition of the Smithsonian Institution for year 1857.

have the honor to be, very respectfully, your obedient servant,

JOSEPH HENRY,
*Secretary Smithsonian Institution.*

Ion. JAMES L. ORR,
*Speaker of the House of Representatives.*

OF THE

# SMITHSONIAN INSTITUTIO

SHOWING

THE OPERATIONS, EXPENDITURES, AND CONDITION OF THE INSTITUTION UP TO JA
1, 1858, AND THE PROCEEDINGS OF THE BOARD UP TO MAY 19, 1858.

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*To the Senate and House of Representatives:*

In obedience to the act of Congress of August 10, 1846, establis the Smithsonian Institution, the undersigned, in behalf of the Reg submit to Congress, as a report of the operations, expenditures, condition of the Institution, the following documents:

1. The Annual Report of the Secretary, giving an account o operations of the Institution during the year 1857.
2. Report of the Executive Committee, giving a general state of the proceeds and disposition of the Smithsonian fund, and al account of the expenditures for the year 1857.
3. Report of the Building Committee.
4. Proceedings of the Board of Regents up to May 19, 1858.
5. Appendix.

Respectfully submitted.

R. B. TANEY, *Chancellor.*
JOSEPH HENRY, *Secretar*

## OFFICERS OF THE SMITHSONIAN INSTITUTION.

JAMES BUCHANAN, *Ex officio* Presiding Officer of the Institution.
ROGER B. TANEY, Chancellor of the Institution.

JOSEPH HENRY, Secretary of the Institution.
SPENCER F. BAIRD, Assistant Secretary.
W. W. SEATON, Treasurer.
WILLIAM J. RHEES, Chief Clerk.

ALEXANDER D. BACHE,
JAMES A. PEARCE,
JOSEPH G. TOTTEN, } Executive Committee.

RICHARD RUSH,
WILLIAM H. ENGLISH,
JOSEPH HENRY, } Building Committee.

## REGENTS OF THE INSTITUTION.

JOHN C. BRECKINRIDGE, Vice President of the United States.
ROGER B. TANEY, Chief Justice of the United States.
JAMES G. BERRET, Mayor of the City of Washington.
JAMES A. PEARCE, member of the Senate of the United States.
JAMES M. MASON, member of the Senate of the United States.
STEPHEN A. DOUGLAS, member of the Senate of the United States.
WILLIAM H. ENGLISH, member of the House of Representatives.
L. J. GARTRELL, member of the House of Representatives.
BENJAMIN STANTON, member of the House of Representatives.
GIDEON HAWLEY, citizen of New York.
RICHARD RUSH, citizen of Pennsylvania.
GEORGE E. BADGER, citizen of North Carolina.
CORNELIUS C. FELTON, citizen of Massachusetts.
ALEXANDER D. BACHE, citizen of Washington.
JOSEPH G. TOTTEN, citizen of Washington.

## MEMBERS EX OFFICIO OF THE INSTITUTION.

JAMES BUCHANAN, President of the United States.
JOHN C. BRECKINRIDGE, Vice President of the United States.
LEWIS CASS, Secretary of State.
HOWELL COBB, Secretary of the Treasury.
JOHN B. FLOYD, Secretary of War.
ISAAC TOUCEY, Secretary of the Navy.
AARON V. BROWN, Postmaster General.
J. S. BLACK, Attorney General.
ROGER B. TANEY, Chief Justice of the United States.
JOSEPH HOLT, Commissioner of Patents.
JAMES G. BERRET, Mayor of the City of Washington.

## HONORARY MEMBERS.

ROBERT HARE, of Pennsylvania.
WASHINGTON IRVING, of New York.
BENJAMIN SILLIMAN, of Connecticut.
PARKER CLEAVELAND, of Maine.
A. B. LONGSTREET, of Mississippi.
JACOB THOMPSON, Secretary of the Interior

# PROGRAMME OF ORGANIZATION

OF THE

# SMITHSONIAN INSTITUTION.

[PRESENTED IN THE FIRST ANNUAL REPORT OF THE SECRETARY, AND ADOPTED BY THE BOARD OF REGENTS, DECEMBER 13, 1847.]

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## INTRODUCTION.

*General considerations which should serve as a guide in adopting a Plan of Organization.*

1. WILL OF SMITHSON. The property is bequeathed to the United States of America, "to found at Washington, under the name of the SMITHSONIAN INSTITUTION, an establishment for the increase and diffusion of knowledge among men."

2. The bequest is for the benefit of mankind. The government of the United States is merely a trustee to carry out the design of the testator.

3. The Institution is not a national establishment, as is frequently supposed, but the establishment of an individual, and is to bear and perpetuate his name.

4. The objects of the Institution are, 1st, to increase, and 2d, to diffuse knowledge among men.

5. These two objects should not be confounded with one another. The first is to enlarge the existing stock of knowledge by the addition of new truths; and the second, to disseminate knowledge, thus increased, among men.

6. The will makes no restriction in favor of any particular kind of knowledge; hence all branches are entitled to a share of attention.

7. Knowledge can be increased by different methods of facilitating and promoting the discovery of new truths; and can be most extensively diffused among men by means of the press.

8. To effect the greatest amount of good, the organization should be such as to enable the Institution to produce results, in the way of increasing and diffusing knowledge, which cannot be produced either at all or so efficiently by the existing institutions in our country.

9. The organization should also be such as can be adopted provisionally, can be easily reduced to practice, receive modifications, or be abandoned, in whole or in part, without a sacrifice of the funds.

10. In order to compensate, in some measure, for the loss of time occasioned by the delay of eight years in establishing the Institution,

a considerable portion of the interest which has accrued sho added to the principal.

11. In proportion to the wide field of knowledge to be culti the funds are small. Economy should therefore be consulted construction of the building; and not only the first cost of the should be considered, but also the continual expense of keepin repair, and of the support of the establishment necessarily con with it. There should also be but few individuals permanentl ported by the Institution.

12. The plan and dimensions of the building should be deter by the plan of organization, and not the converse.

13. It should be recollected that mankind in general are to be fitted by the bequest, and that, therefore, all unnecessary expen on local objects would be a perversion of the trust.

14. Besides the foregoing considerations deduced immediatel the will of Smithson, regard must be had to certain require of the act of Congress establishing the Institution. These library, a museum, and a gallery of art, with a building on a l scale to contain them.

## SECTION I.

*Plan of Organization of the Institution in accordance with the for deductions from the will of Smithson.*

To Increase Knowledge. It is proposed—

1. To stimulate men of talent to make original researches, by ing suitable rewards for memoirs containing new truths; and

2. To appropriate annually a portion of the income for part researches, under the direction of suitable persons.

To Diffuse Knowledge. It is proposed—

1. To publish a series of periodical reports on the progress different branches of knowledge; and

2. To publish occasionally separate treatises on subjects of g interest.

### DETAILS OF THE PLAN TO INCREASE KNOWLEDGE.

#### I.—*By stimulating researches.*

1. Facilities afforded for the production of original memoirs branches of knowledge.

2. The memoirs thus obtained to be published in a series of vol in a quarto form, and entitled Smithsonian Contributions to ledge.

3. No memoir on subjects of physical science to be accept publication which does not furnish a positive addition to knowledge, resting on original research; and all unverified s tions to be rejected.

4. Each memoir presented to the Institution to be submit examination to a commission of persons of reputation for learr

the branch to which the memoir pertains; and to be accepted for publication only in case the report of this commission is favorable.

5. The commission to be chosen by the officers of the Institution, and the name of the author, as far as practicable, concealed, unless a favorable decision be made.

6. The volumes of the memoirs to be exchanged for the transactions of literary and scientific societies, and copies to be given to all the colleges and principal libraries in this country. One part of the remaining copies may be offered for sale; and the other carefully preserved, to form complete sets of the work, to supply the demand from new institutions.

7. An abstract, or popular account, of the contents of these memoirs to be given to the public through the annual report of the Regents to Congress.

II.—*By appropriating a part of the income, annually, to special objects of research, under the direction of suitable persons.*

1. The objects, and the amount appropriated, to be recommended by counsellors of the Institution.

2. Appropriations in different years to different objects, so that, in course of time, each branch of knowledge may receive a share.

3. The results obtained from these appropriations to be published, with the memoirs before mentioned, in the volumes of the Smithsonian Contributions to Knowledge.

4. Examples of objects for which appropriations may be made.

(1.) System of extended meteorological observations for solving the problem of American storms.

(2.) Explorations in descriptive natural history, and geological, magnetical, and topographical surveys, to collect materials for the formation of a Physical Atlas of the United States.

(3.) Solution of experimental problems, such as a new determination of the weight of the earth, of the velocity of electricity, and of light; chemical analyses of soils and plants; collection and publication of scientific facts, accumulated in the offices of government.

(4.) Institution of statistical inquiries with reference to physical, moral, and political subjects.

(5.) Historical researches and accurate surveys of places celebrated in American history.

(6.) Ethnological researches, particularly with reference to the different races of men in North America; also, explorations and accurate surveys of the mounds and other remains of the ancient people of our country.

## DETAILS OF THE PLAN FOR DIFFUSING KNOWLEDGE.

I.—*By the publication of a series of reports, giving an account of the new discoveries in science, and of the changes made from year to year in all branches of knowledge not strictly professional.*

1. These reports will diffuse a kind of knowledge generally interesting, but which, at present, is inaccessible to the public. Some of the

reports may be published annually, others at longer intervals, as the income of the Institution or the changes in the branches of knowledge may indicate.

2. The reports are to be prepared by collaborators eminent in the different branches of knowledge.

3. Each collaborator to be furnished with the journals and publications, domestic and foreign, necessary to the compilation of his report; to be paid a certain sum for his labors, and to be named on the title-page of the report.

4. The reports to be published in separate parts, so that persons interested in a particular branch can procure the parts relating to it without purchasing the whole.

5. These reports may be presented to Congress for partial distribution, the remaining copies to be given to literary and scientific institutions, and sold to individuals for a moderate price.

The following are some of the subjects which may be embraced in the reports:

### I. PHYSICAL CLASS.

1. Physics, including astronomy, natural philosophy, chemistry, and meteorology.
2. Natural history, including botany, zoology, geology, &c.
3. Agriculture.
4. Application of science to arts.

### II. MORAL AND POLITICAL CLASS.

5. Ethnology, including particular history, comparative philology, antiquities, &c.
6. Statistics and political economy.
7. Mental and moral philosophy.
8. A survey of the political events of the world, penal reform, &c.

### III. LITERATURE AND THE FINE ARTS.

9. Modern literature.
10. The fine arts, and their application to the useful arts.
11. Bibliography.
12. Obituary notices of distinguished individuals.

II. *By the publication of separate treatises on subjects of general interest.*

1. These treatises may occasionally consist of valuable memoirs translated from foreign languages, or of articles prepared under the direction of the Institution, or procured by offering premiums for the best exposition of a given subject.

2. The treatises should, in all cases, be submitted to a commission of competent judges previous to their publication.

:. As examples of these treatises, expositions may be obtained of present state of the several branches of knowledge mentioned in table of reports.

## SECTION II.

*an of organization, in accordance with the terms of the resolutions of the Board of Regents providing for the two modes of increasing and diffusing knowledge.*

1. The act of Congress establishing the Institution contemplated e formation of a library and a museum; and the Board of Regents, cluding these objects in the plan of organization, resolved to divide e income* into two equal parts.

2. One part to be appropriated to increase and diffuse knowledge y means of publications and researches, agreeably to the scheme efore given. The other part to be appropriated to the formation of library and a collection of objects of nature and of art.

3. These two plans are not incompatible one with another.

4. To carry out the plan before described, a library will be required, onsisting, 1st, of a complete collection of the transactions and proceedings of all the learned societies in the world; 2d, of the more mportant current periodical publications, and other works necessary n preparing the periodical reports.

5. The Institution should make special collections, particularly of bjects to illustrate and verify its own publications.

6. Also, a collection of instruments of research in all branches of xperimental science.

7. With reference to the collection of books, other than those menioned above, catalogues of all the different libraries in the United tates should be procured, in order that the valuable books first purhased may be such as are not to be found in the United States.

8. Also, catalogues of memoirs, and of books and other materials, hould be collected for rendering the Institution a centre of bibliorraphical knowledge, whence the student may be directed to any work hich he may require.

9. It is believed that the collections in natural history will increase y donation as rapidly as the income of the Institution can make prosion for their reception, and, therefore, it will seldom be necessary purchase articles of this kind.

10. Attempts should be made to procure for the gallery of art casts the most celebrated articles of ancient and modern sculpture.

11. The arts may be encouraged by providing a room, free of exense, for the exhibition of the objects of the Art-Union and other milar societies.

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*The amount of the Smithsonian bequest received into the Treasury of the United States is..... $515,169 00
Interest on the same to July 1, 1846, (devoted to the erection of the building)..... 242,129 00
Annual income from the bequest..... 30,910 14

12. A small appropriation should annually be made for models of antiquities, such as those of the remains of ancient temples, &c.

13. For the present, or until the building is fully completed, besides the Secretary, no permanent assistant will be required, except one, to act as librarian.

14. The Secretary, by the law of Congress, is alone responsible to the Regents. He shall take charge of the building and property, keep a record of proceedings, discharge the duties of librarian and keeper of the museum, and may, with the consent of the Regents, *employ assistants.*

15. The Secretary and his assistants, during the session of Congress, will be required to illustrate new discoveries in science, and to exhibit new objects of art; distinguished individuals should also be invited to give lectures on subjects of general interest.

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This programme, which was at first adopted provisionally, has become the settled policy of the Institution. The only material change is that expressed by the following resolutions, adopted January 15, 1855, viz:

*Resolved*, That the 7th resolution passed by the Board of Regents, on the 26th of January, 1847, requiring an equal division of the income between the active operations and the museum and library, when the buildings are completed, be and it is hereby repealed.

*Resolved*, That hereafter the annual appropriations shall be apportioned specifically among the different objects and operations of the Institution, in such manner as may, in the judgment of the Regents, be necessary and proper for each, according to its intrinsic importance, and a compliance in good faith with the law.

# REPORT OF THE SECRETARY FOR 1857.

*To the Board of Regents:*

GENTLEMEN: It again becomes my duty to present to you the history of the operations of another year of the Institution which the government of the United States has entrusted to your care. In an establishment of this kind, of which the policy has been settled and is strictly adhered to, there must of necessity be much sameness in the general form and character of the successive reports; but since the field of science is boundless, and new portions of it are continually presented for investigation, there will always be found in the details, facts of sufficient interest to relieve the routine of the statements relative to the condition of the funds and the scrutiny of the receipts and expenditures.

It might at first sight appear surprising that so constant a supply of materials for the Smithsonian Contributions and so many objects of interest, demanding the assistance of the Smithsonian fund, should be presented, but it will be evident, on reflection, that this results from the influence of the Institution itself in increasing the number of laborers in the field of science, as well as in accumulating the materials on which they are to be engaged. The tendency is constantly to expand the operations, and much caution and self-control are necessary to repress the desire to be more liberal in the assistance rendered to worthy objects, than the income will permit. Indeed, a charge is frequently made of illiberality for what is the result of restricted means. It must be evident that nothing is more important to the permanency and proper conduct of the Institution than the cautious and judicious management of its funds. Any embarrassment in this quarter would involve a loss of confidence in the directors, which would be fatal to the usefulness and efficiency of the establishment.

I have from the first expressed the regret that the original law of Congress directed the expenditure of so large a portion of the income on objects of a local character, and this feeling has been increased by the experience which time has afforded in regard to the good which could be effected by a more critical observance of the terms of the

bequest, as well as by the increasing expense of sustaining a large building, a library, and museum. It is to be hoped, however, that at least a partial relief will hereafter be afforded by an annual appropriation, which it is reasonable to expect government will make for the keeping and exhibition of the collections of the various exploring expeditions which have been entrusted to the care of the Regents.

At the last session of Congress an appropriation was made for the construction and erection of cases to receive the collections of the United States Exploring Expedition and others in Washington, and also for the transfer and arrangement of the specimens. This appropriation was granted in accordance with the recommendation of the late Secretary of the Interior and the Commissioner of Patents, in order that the large room in the Patent Office occupied by the museum might be used for the more legitimate purposes of that establishment. We presume that the other part of the recommendation will also be carried out, namely, that the annual appropriation be continued which has heretofore been made for the care of this portion of the government property. While, on the one hand, no appropriation should be made which would serve to lessen the distinctive character of Smithson's bequest, on the other it is evident that the government should not impose any burdens upon the Institution which would impair its usefulness or divert its funds from their legitimate purpose.

It was stated in the last report that the extra fund of the Institution, which had been saved from the accrued interest, was invested in State Stocks. This investment was made because the fund was at the time drawing no interest, and because, until action could be procured by Congress in relation to receiving said fund into the United States Treasury, it was deemed the safest disposition of the money. Though a temporary depreciation of these stocks took place during the last year, there is no reason to regret the investment. Their marketable value is at present about the same as it was at the time they were purchased.

By reference to the report of the Executive Committee it will be seen that the expenditures during the year, though less than the amount of receipts, have somewhat exceeded the estimates. This has been occasioned, first, by unexpected repairs which were found necessary to the building, in consequence of an unprecedented hail storm, which destroyed several thousand panes of glass and did considerable injury to the roof and other parts of the edifice; secondly, by an expansion of the system of foreign exchanges, rendered necessary by the large amount of material entrusted to the Institution by the

different agricultural and other societies of the country; and thirdly, the necessity we were under, on account of the financial pressure, of paying bills for publications which will appear during the present and the next year. The funds of the Institution are, however, still in a prosperous condition, but great care is required to prevent the accumulation of small expenses, which, individually, by reason of their insignificance, are allowed to occur, but which in the aggregate, at the end of the year, are found to have swelled into amounts of considerable magnitude.

*Publications.*—The ninth annual quarto volume of Contributions to Knowledge was completed and distributed during the first half of the year. It is equal in size and importance to the preceding volumes, and contains the following memoirs:

1. On the relative intensity of the heat and light of the sun upon different latitudes of the earth. By L. W. Meech.

2. Illustrations of surface geology, by Edward Hitchcock, LL.D., of Amherst College.

Part 1. On surface geology, especially that of the Connecticut valley, in New England.

Part 2. On the erosions of the earth's surface, especially by rivers.

Part 3. Traces of ancient glaciers in Massachusetts and Vermont.

3. Observations on Mexican history and archæology, with a special notice of Zapotec remains, as delineated in Mr. J. G. Sawkins' drawings of Mitla, &c. By Brantz Mayer.

4. Researches on the Ammonia Cobalt bases. By Professor Wolcott Gibbs and Professor F. A. Genth.

5. New tables for determining the values of the co-efficients in the perturbative functions of planetary motion, which depend upon the ratio of the mean distances. By J. D. Runkle.

6. Asteroid supplement to new tables for determining the values of $b_{\frac{1}{2}}^{(i)}$ and its derivatives. By J. D. Runkle.

It was stated in the last report that Mr. L. W. Meech proposed to continue his interesting investigations relative to the heat and light of the sun, provided the Smithsonian Institution would pay the expense of the arithmetical computations. Though most of his time is necessarily occupied in other duties, he would cheerfully devote his leisure hours to the investigation with a view of extending the bounds

of knowledge. During the past year an appropriation has been made of one hundred dollars for the purpose here mentioned, and we are assured, from what Mr. Meech has already accomplished, that this sum will be instrumental in producing valuable results. He proposes to determine, from several elementary formulas, the laws of terrestrial temperature for different latitudes. The first formula has been pretty thoroughly applied, and the annual temperature computed by it compared with the result of actual observation. The diurnal temperatures have also been deduced and seem to agree with actual observation within the presumed errors of the latter. The temperature, however, of the surrounding medium, derived from the *annual* temperature, differs widely from the results obtained by the *diurnal* temperatures. The author is inclined to attribute this difference to a defect in the law of radiation as generally received, which, deduced from experiments in the laboratory, he thinks inapplicable to the phenomena of terrestrial temperature. The second formula takes into account another cause of the variation of temperature, namely, the cooling due to the contact of the air; and the third formula includes also the effect of the absorption of solar heat in its passage through the atmosphere. The investigation will include the consideration of—1st, terrestrial radiation; 2d, contact of air; 3d, the sun's intensity; 4th, atmospheric absorption; 5th, the difference in radiating power of luminous heat by day and non-luminous heat by night. Among other inferences to be deduced is the relative heating or radiating powers of sea and continent, when the land is covered with foliage and vegetation, and when it is covered with ice and snow. These researches are intimately connected with the extended series of observations on the climate of the United States, now carried on at the expense and under the direction of the Institution.

The paper of Professor Gibbs and Dr. Genth, which forms a part of the 9th volume, has been republished in the American Journal of Science and in the London Chemical Gazette, due credit being given to the Smithsonian Contributions, from which it was copied. We regret to be informed by the authors of this interesting paper that the sum appropriated by the Institution for assisting in defraying the expense of the materials and apparatus employed in their researches was scarcely sufficient to compensate for more than one-fourth of their outlay. Limited means, and not a want of proper appreciation of the labors of these gentlemen, prevented their entire reimbursement for the pecuniary loss in the prosecution of their valuable researches. They intend, notwithstanding this, to continue their investigations,

and to devote as much time to them as their other engagements and the means at their disposal will allow. Since this memoir has met the approval of the scientific world, it will be proper to make as liberal an appropriation as the demands on the limited income of the Institution will permit for the continuance of researches in the same line. The publication of the paper was of comparatively little expense, since it required no costly illustrations, and this may be an additional reason for granting a larger appropriation for further investigations in the same line.

The ninth volume also contains the supplement to the tables by J. D. Runkle, mentioned in the last report. The tables in this supplement are intended to facilitate calculations with reference to the asteroids. The search for these bodies has been prosecuted with so much vigor of late that their list now extends to more than fifty, and the mechanical labor required to calculate their places is so great that this can scarcely be expected to be accomplished, except by the use of general tables. The work of Gauss on the theory of the motion of the heavenly bodies leaves little to be desired, so far as the determination of their orbits is concerned; but this is by no means the case with regard to their perturbations by the larger planets. The tables therefore will afford an important means of facilitating the advance of our knowledge, particularly of this class of the members of our solar system.

The third part of the Nereis Boreali-Americana, by Dr. William H. Harvey, has been completed and will be included in the tenth volume of the Contributions. Two hundred extra copies of the text of the preceding parts having been struck off before the distribution of the types, and the drawings on the lithographic stones having been preserved, an equal number of plates from the latter have been printed and colored, so that we shall be enabled to make up two hundred copies of the complete work to be offered for sale, which will serve, it is hoped, to reimburse, in some degree, the heavy expense incurred in the publication of this interesting addition to the science of botany. It may be proper to mention that the work was published in numbers, in order that the whole expense should be defrayed by the appropriation of different years, as well as to furnish the author the opportunity of rendering the work more complete by more extended research.

For the purpose of classification, the sea plants have been grouped

under three principal heads which are readily distinguished by their general color.

They are as follows:

1. Melanospermeæ—plants of an olive-green or olive-brown color.
2. Rhodospermeæ, or plants of a rosy-red or purple color.
3. Chlorospermeæ, or plants of a grass, rarely of a livid purple color.

The numbers of the work already published relate to the first two divisions, and the third, now about to be issued, will contain the last, with an appendix describing new species discovered since the date of the former parts.

The text of the first part of the work on Oology, mentioned in preceding reports, has been printed; but the publication of the plates to accompany it will be so expensive that we were obliged to defer it until the present year. In the meantime the author will proceed with the preparation of the other parts of the memoir, and the whole will be completed as soon as the funds of the Institution will permit. From an accidental oversight in the preparation of the last Report, I neglected to mention the fact that the author of this interesting work is Dr. Thomas M. Brewer, of Boston. The omission of his name in the reports would not only be unjust to himself, but might also prevent him from receiving in some cases additional information relative to his labors from correspondents who are engaged in the same line of research. The announcement of the fact of the intended publication of this memoir has induced a number of persons to enter into correspondence with the Institution on the subject, and we doubt not that these remarks will tend to call forth other additions to our knowledge of this branch of natural history.

Since the date of the last Report a grammar and dictionary of the Yoruba language of Africa have been accepted for publication. Thi work is another contribution from the missionary enterprise of the present day, and has been prepared by the Rev. Thos. J. Bowen, of the Southern Baptist Missionary Board, from materials collected during a residence of six years in Africa, and revised and rewritten with the aid of W. W. Turner, esq., of Washington. The grammar and dictionary are prefaced by a brief account of the country and its inhabitants. The long residence of the author in this part of the interior of Africa has enabled him to gather more minute knowledge of its topography, climate, and productions, and of the political, social, and moral relations of its inhabitants than has before been obtained. He

has collected interesting information as to the habits of thought and action of the people, and their capacity for moral and intellectual culture, which would have escaped the casual notice of the mere traveller.

Yoruba is a country of Western Africa, situated to the east of Dahomey, and extending from the Bight of Benin, in a northerly direction, nearly to the Niger. It is between the countries explored by the distinguished travellers, Barth, on the north, and Livingstone, on the south. The author describes it as a beautiful and fertile region, densely inhabited by a population devoted to agricultural pursuits, who do not dwell on the lands they cultivate, but live clustered together in villages and towns, some of which contain from 20,000 to 70,000 inhabitants. The people are generally of a primitive, simple and harmless character, and governed by institutions patriarchal rather than despotic. In their appearance they resemble the Caucasian race, while their mental powers and general moral impulses are considerably advanced in the scale of intelligence. They have, indeed, already attained no inconsiderable degree of social organization, while they have escaped some of the more depraved incidents of an advanced civilization.

The language, which is said to be spoken by about two millions of people, is represented by Professor Turner to be very homogeneous in its structure, almost all of it being derived from some five hundred primitive words. "Its articulations are sufficiently easy to imitate, and there is a system of vocalic concords recurring through the whole, which, together with the multiplicity of vowels, renders it decidedly euphonious. The great difficulty is found in the tones and accents, which can be discriminated only by a good ear, and must be uttered correctly to make the speaker intelligible. The Yoruba has neither article nor adjective, properly so called, and it is almost wholly destitute of inflection. The verbal root remains unchanged through all the accidents of person, mood, and tense, which are indicated by separate pronouns and particles. The plurality of nouns is also indicated by the aid of a plural pronoun. The numerals are based on the decimal system, yet many of them are formed by subtraction instead of addition or multiplication, as with us. Thus 15 is literally $10 + 5$; but $16 = 20 - 4$, $17 = 20 - 3$, &c. Although this language is spoken by a rude people, it abounds in abstract terms, and the missionary finds no difficulty in expressing in it the ideas he desires to communicate."

It is believed that this work will be received by the student of ethnology as an interesting addition to this science, and that its publication will not only facilitate the labors of the missionary, but be productive of valuable commercial results. The country in which the language is spoken is rich in natural and artificial productions, and as the inhabitants are anxious to establish relations of trade with other parts of the world, it would seem to offer a new and tempting field to mercantile enterprise.

Under the head of publications, we may allude to the Appendix to the Annual Report of the Regents. Previous to 1853 this report was in a pamphlet form, and only in one or two cases were a few extra copies ordered. Since that date an annual volume has been presented to Congress, of which twenty thousand extra copies have been printed. The liberal distribution of this work has met with general approbation, the applications to the Institution for copies have been constantly increasing, and, in connexion with the Report of the Patent Office, no document has become more popular or is better calculated to advance the cause of knowledge among the people. The object is, as far as possible, to distribute this volume among teachers, and through them to diffuse precise scientific knowledge to the rising generation. It is made also the vehicle of instruction, in the line of observations, to all who are desirous of co-operating in the investigation of the natural history and physical geography of this country. The wide distribution of this report has tended, more than any other means, to make known the character of the Institution, and to awaken an interest throughout the whole country in its prosperity.

In order to render the series complete, the first volume—that for 1853—contained a reprint of the previous reports of the Secretary, from which a connected history of all the operations of the Institution from the beginning may be obtained. These volumes are illustrated by a large number of wood cuts, which have been provided at the expense of the Smithsonian fund. We have, however, to regret that, from the rapidity with which Congressional documents are hurried through the press, we have not been allowed in all cases revised copies of the proof. We cannot, therefore, be held entirely responsible for inaccuracies of the press any more than for the style of printing or the quality of the paper.

It is a part of the settled policy of the Institution to appropriate its funds, as far as the original law of organization will allow, to such objects only as cannot as well be accomplished by other means; and accordingly, in several instances, the printing of papers previously

accepted for publication has been relinquished because it was subsequently found that the works could be given to the public, under certain conditions, through other agencies. In such cases the favorable opinion expressed by the Institution as to the character of the work, or the assistance rendered by the subscription on the part of the Regents, for a number of copies to be distributed in exchange for other books among our foreign correspondents, has been sufficient to induce some liberal minded parties to undertake the publication, rather as an enterprise connected with the reputation of their establishments, than as a matter of profit.

Among the works of this class is the "Theory of the Motion of the Heavenly Bodies," by the celebrated Gauss, translated by Captain C. H. Davis, U. S. N., late superintendent of the Nautical Almanac, which was originally accepted by us for publication, but was afterwards relinquished to Messrs. Little & Brown, of Boston, who have shown in this instance, as well as in others of a similar character, a liberality which cannot be otherwise than highly appreciated by a discerning public. This book, which is essential to the advance of practical astronomy, was published in Latin, in Hamburg, in 1809, and is now of difficult access, as well as of restricted use, on account of the language in which it appeared. It gives a complete system of formulas and processes for computing the movement of a body revolving in an ellipse, or in any other curve belonging to the class of conic sections, and explains a general method of determining the orbit of a planet or a comet from three observations of the position of the body as seen from the earth. The essay was called for at the time it was produced by the wants of science. The planet Ceres, discovered on the first day of the present century by Piazzi, of Italy, had been lost to astronomers in its passage through the portion of the heavens illuminated by the beams of the sun, and could not be found by the means then known, when Gauss, from a few observations of its former place, calculated its orbit, and furnished an ephemeris by which it was readily rediscovered. The methods employed in this determination were afterwards given in a systematic form in the work now translated. The copies subscribed for by the Institution, on account of exchanges, and those paid for by the Navy Department, for the use of the computers of the Nautical Almanac, were sufficient to secure the publication of the work, which could not have been undertaken without these aids.

In accordance with the same policy the Institution has subscribed for a few copies of a work on "The Pleiocene Fossils of South Caro-

lina," by M. Tuomey and F. S. Holmes. This work received the commendation of some of the distinguished members of the American Association for the Advancement of Science, at its meeting in Charleston, in 1850, and its publication was undertaken at the risk and cost of the authors. The actual expense, however, far exceeded their estimate, and without the liberal aid of the legislature of South Carolina they could not have escaped heavy loss, or been enabled to complete the work in a proper style of art. To aid the same enterprise the Institution was induced to make the subscription above mentioned for copies to be distributed to foreign societies. We regret to state that before the work was fully completed the science of the country was called to mourn the loss of Professor Tuomey, of the University of Alabama, who, during the past year, was prematurely snatched away from his family and friends in the flower of his age. His works, however, will remain as an inheritance to the cause of knowledge and the best monument to his memory. We have been gratified to learn that, at the late session of the legislature of South Carolina, a resolution was passed authorizing a continuance of the patronage of the State to the publication of these researches, and consequently Professor Holmes has signified his intention to publish two additional volumes on the Eocene and the Post Pleiocene Fossils, to which the subscription of the Institution will also be extended.

Another work, belonging to the same class, is the series of "Contributions to the Natural History of the United States of America," by Professor Louis Agassiz. It has been mentioned in a previous report that this distinguished *savan* was preparing a series of papers to be presented to the Smithsonian Institution, and that the plates for some of these had been engraved. But the number of these contributions, and the cost of their illustration, would have absorbed a larger portion of the Smithsonian fund than could have properly been devoted to the labors of one individual. Fortunately, however, the reputation and popularity of Professor Agassiz have enabled his friends to procure subscribers for an independent work, containing the result of his valuable investigations, in numbers unprecedented in the annals of science of this or of any other country. In order to assist this enterprise in the beginning, and to relieve its own funds, the Institution subscribed for copies, to be distributed among foreign libraries, in exchange for rare works of a similar character, with which to enrich its own library.

The Institution has also facilitated the researches described in the first two volumes of the work in question, and I may quote the

following sentence containing the acknowledgment of the author for the services which have thus been rendered him: "Above all, I must mention the Smithsonian Institution, whose officers, in the true spirit of its founder, have largely contributed to the advancement of my researches by forwarding to me for examination not only all the specimens of Testudinata collected for the museum of the Institution, but also those brought to Washington by the naturalists of the different parties that have explored the western Territories, or crossed the continent with the view of determining the best route for the Pacific railroad. These specimens have enabled me to determine the geographical distribution of this order of reptiles with a degree of precision which I could not have attained without this assistance." Besides this, the Institution caused special collections of turtles to be made for Professor Agassiz, from those parts of the country from which no specimens had previously been obtained.

It was originally intended, as announced in the prospectus, to issue one volume a year, but the author found that the first volume was insufficient to contain all the matter which he had designed to give in it. Its publication was therefore delayed, that the whole of this part of his general subject might be presented at once, and hence two volumes have been issued together. The large subscription which has been obtained has enabled the publishers to extend the original plan, and to expend a much greater sum on the engravings than was at first thought possible. The work will serve to increase and extend the reputation of the illustrious author, as well as to afford a striking example of the liberality of our country and its growing appreciation of abstract science.

Under the head of publications, and in justice to the memory of a distinguished naturalist, a profound scholar, and a worthy man, the late Dr. Gerard Troost, of Tennessee, it ought to be stated in this Report, that after his death, several years ago, a memoir he had prepared on the organic remains known as Crinoidea, illustrated by a collection of specimens, was presented to the Smithsonian Institution for publication. It was submitted to two naturalists of high reputation, and found by them to be an important addition to knowledge, though left by its author in an unfinished condition. The gentlemen to whom it was referred generously offered to supply the deficiencies, and to prepare the work for the press. Their engagements, however, have since been such as to prevent up to this time the completion of the task which they undertook to accomplish. One of the gentlemen

to whom the paper was referred, Prof. James Hall, in whose possession the specimens now are, states that he had hoped long since to put the memoir in such a form as to do justice to the memory of Dr. Troost, and be in accordance with the latest views of the subject. To do this, however, required an examination of other specimens, and for this object he had never been able to find time. At present he is engaged in a geological report of Iowa, in which there are several plates of Crinoids, and any which may be identical with those described by Dr. Troost will be accredited to him. We regret exceedingly this long delay in the publication of the labors of one so highly esteemed in life and gratefully remembered in death. It has, however, been caused by circumstances over which we had no control, and which have given us considerable disquietude.

The new and extended series of Meteorological and Physical Tables, which has been in course of preparation for several years, is at length completed and ready for distribution. It forms a volume of 634 large octavo pages, which may be divided into separate parts, each distinct in itself. A copy of these tables will be sent to each of the meteorological observers, and it is believed that a considerable number may be sold in this country and Europe, from which something may be derived towards compensating the author, Prof. Guyot, for the unwearied labor and attention he has bestowed upon the work.

At the request of the Institution, Baron Osten Sacken, of the Russian legation, who has made a special study of Dipterous Insects has prepared a catalogue of the previously described species of this continent, analogous to that of Melsheimer's catalogue of the Cleoptera of the United States, which was published some years ago by this Institution.

It frequently happens that the same animal is described by different naturalists under different names, and there may be among the species enumerated in this catalogue some of this character, but in the present state of the knowledge of American Diptera the publication of a complete synonymical catalogue is impossible. Yet a list like the one just completed is an indispensable preparatory work for the future study of this branch of entomology. The catalogue includes the species inhabiting not only the North American continent in general, but also those in Central America and in the West Indies. It also gives the principal localities where each species has been found. In a list like this, says the author, completeness is the principal merit; the symmetrical arrangement is but of secondary importance.

The groups adopted by Meigen and Wiedemann are retained, avoiding the subdivisions introduced by modern authors.

The publication of this list, we trust, will very much facilitate the study of entomology, and it is a special object of this Institution to encourage individuals to devote themselves to particular subjects of research. The field of nature is so extended that unless it be minutely subdivided, and its several parts cultivated by different persons, little progress of a definite character can be anticipated. To collect the materials for wider generalizations, microscopic research is necessary in every direction, and men enthusiastically devoted to one object are required in every branch of knowledge in order that the whole may be perfected. It is true, before entering on an investigation of this kind, that it is desirable for the individual to have a general knowledge of the different branches of science, since they are all intimately connected; and the student can then narrow his field of view until it comes within the scope of his mental abilities, or the means which he may have at his disposal for its advancement. As a general rule, however, the ability to enlarge the bounds of science can only be obtained by almost exclusive devotion to a few branches.

It is scarcely possible to estimate too highly, in reference to the happiness of the individual as well as to the promotion of knowledge, the choice in early life of some subject to which the thoughts can be habitually turned during moments of leisure, and to which observation may be directed during periods of recreation, relative to which facts may be gleaned from casual reading, and during journeys of business or of pleasure. It is well that every one should have some favorite subject of which he has a more minute knowledge than any of his neighbors. It is well that he should know some one thing profoundly, in order that he may estimate by it his deficiencies in others.

In this connexion it may be proper to remark that the association of individuals in the same community, each with a special and favorite pursuit, each encouraging the others, each deferring to the others, and each an authority in his own specialty, forms an organization alike valuable to the individual, the community, and the public generally. To induce and encourage the establishment of such associations is one of the objects of the Institution. It is suprising what interest may be awakened, what amount of latent talents developed, and what dignity imparted to the pursuits of a neighborhood by a society in which the knowledge of each becomes common property,

and the labors of each one are stimulated by the appreciation and applause of his fellows.

I am acquainted with no plan of adult education better calculated to elevate the mental character of a community or to develop the local natural history of a district than that of a well organized and efficiently conducted association of this kind. Such establishments, I am happy to say, are now becoming common in every part of the United States. They have taken the place, in many cases, of the debating societies, which were formerly instituted for mental improvement. To the latter it might justly be objected that they tend to promote a talent of sophistical reasoning, rather than to engender an uncompromising love of truth. The habit of fluent speaking may undoubtedly be cultivated at the expense of profound thought, and however promotive at times of the temporary interests of the individual, can never be supposed to tend to the permanent advancement of the species.

*Meteorology.*—The system of meteorological observations under the direction of the Institution and the Patent Office has been so repeatedly described in previous reports that it will scarcely be necessary to give any more at this time than an account of the present state of the work. The system was commenced in 1849, and has since then been gradually improving in the number of observers, character of the instruments, and the precision with which the records are made. The Institution has awakened a wide interest in the subject of meteorology, and has diffused a considerable amount of information with regard to it which could not readily be obtained through other means. The manufacture of instruments, compared with standards furnished by the Institution from London and Paris, has been an important means of advancing the science. The work is still continued by James Green, 173 Grand street, New York, and during the past year an increasing number of full sets has been purchased by observers. The Institution has continued to distribute rain-gages, with which observations are now made on the quantity of aqueous precipitation in nearly every State and Territory of the Union.

We are indebted to the National Telegraph line for a series of observations from New Orleans to New York, and as far westward as Cincinnati, Ohio, which have been published in the "Evening Star," of this city. These reports have excited much interest, and could they be extended further north, and more generally to the westward, they would furnish important information as to the ap-

proach of storms. We hope in the course of another year to make such an arrangement with the telegraph lines as to be able to give warning on the eastern coast of the approach of storms, since the investigations which have been made at the Institution fully indicate the fact that as a general rule the storms of our latitude pursue a definite course.

The materials which have been collected relative to the climate of the North American continent are as follows:

1st. A miscellaneous collection of MSS. and other tables relative to the climate of the United States. This series will be enriched by a reference list to all the meteorological records, which are to be found in the extensive library of Mr. Peter Force, of this city, and other accessible sources of information.

2d. The observations made under the direction of this Institution since 1849.

3d. A series of observations made by Dr. Berlandier in Mexico.

4th. Observations made in the British possessions.

5th. The record of observations made by government and other exploring expeditions.

6th. Copies of the observations made under the direction of the Surgeon General at the military posts.

7th. Copies of the observations made at the expense of the States of New York, Massachusetts, Pennsylvania, Maine, and Missouri.

8th. A series of observations from Bermuda and the West Indies.

Besides these, the Institution is endeavoring to obtain, by means of its exchanges, a full series of all observations which have been made in foreign countries, and to form a complete meteorological library.

Complaint has been made on account of the delay in publishing deductions from the materials which have thus been collected, but, with the limited means of the Institution, it should be recollected that all objects enumerated in the programme of organization cannot be simultaneously accomplished. The reductions have been steadily pursued for the last five years, and all the funds, not otherwise absolutely required, have been devoted by the Institution to this object.

It will be a matter of astonishment to those not practically acquainted with the subject, to be informed as to the amount of labor required for the reduction of the returns made to this Institution for a single year. During 1856 the records of upwards of half a million of separate observations, each requiring a reduction involving an arithmetical calculation, were received at the Institution. Allowing an average of one minute for the examination and reduction of each

observation, the amount of time consumed will be nearly 7,000 hours, or, at the rate of seven hours per day, it will be 1,000 days or upwards of three years, or, in other words, to keep up with the reduction of the current observations the whole available time of three expert computers is required. This is independent of the labor expended in the correspondence, preparation and distribution of blank forms, and the deduction of general principles. The work has been prosecuted, therefore, as rapidly as the means at the disposal of the Institution would permit. Since the arrangement was made with the Patent Office, from twelve to fifteen persons, many of them females, have been almost constantly employed, under the direction of Prof. Coffin, in bringing up the arrears and in reducing the current observations.

All the materials collected at the Institution are in the process of being arranged and bound in accessible volumes, with proper indices, to be used by all who may be desirous of making special investigations on any point relative to the climate of this country.

During the past year the reductions for 1855 were printed in pamphlet form and distributed to observers for criticism and suggestions as to improvements which might be adopted in the subsequent publication of the entire series.

*Exchanges.*—The system of international exchange has been carried on during the past year with unabated zeal, and we trust with undiminished good results. A large amount of scientific material has passed through our hands in its transfer to and from societies and individuals in this and other countries. The returns made to the Institution during 1857 for its own publications consist of 555 volumes, 1,067 parts of volumes, and 138 charts. These works embrace most of the current volumes of scientific transactions, and are of the highest importance as aids in original research. The number would be very much increased if the contents of several large cases, which were accidentally delayed until the beginning of this year, were included.

The importance of the exchanges is not to be estimated by the commercial value alone of the books received. In addition to this we must consider the effect which it produces in bringing into immediate communication the cultivators of literature and science in this country with those abroad, of distributing among our societies publications of a class, the existence of which would scarcely otherwise be known, and of facilitating the diffusion of knowledge which, by the ordinary modes of transmission, would not be attained, except, perhaps, in the course of years.

The system has now attained a great development, and increases measurably every year. The expenses hitherto have been principally borne by the Institution, but their amount has now become so great as seriously to interfere with other operations, and I therefore think it advisable that a charge be made, to the parties receiving a certain amount of packages annually, sufficient to reimburse some of the outlay of the Smithsonian funds. What would not be felt by each one individually would, in the aggregate, materially lessen the burden of expense connected with this part of the operations, which amounted, in 1857, to about $3,000.

The expenses of the Smithsonian exchanges would be considerably greater than they are but for the liberality of various transportation companies in carrying packages free of cost. No charge on freight is made by the United States Mail Steamship Company, the Panama Railroad, or the Pacific Mail Steamship Company, forming the mail line from New York to San Francisco, while the agents of the line in these two cities, Messrs. I. W. Raymond and A. B. Forbes, serve the Institution in various ways. The California Express Agency of Wells, Fargo & Co., has also acted with the greatest liberality, and the same should be stated of the old line of Bremen and New York steamers. None of the domestic agents of distribution—namely, Hickling, Swan & Brewer, of Boston; D. Appleton & Co., New York; J. B. Lippincott & Co., Philadelphia; John Russell, Charleston; B. M. Norman, New Orleans; Dr. Wislizenus, St. Louis; H. W. Derby, Cincinnati; and Henry P. B. Jewett, of Cleveland—make any charge for services; and the same may also be said of Messrs. Oelrichs & Lürman, of Baltimore.

The amount of labor involved in the exchanges is, of course, very great, as will be readily inferred from an examination of the tables of receipts and transmissions during the past year, given by Professor Baird. The entries in the several record books fill over 700 pages; the circulars, invoices, and acknowledgments, exceed 4,300, in addition to over 600 receipts for packages. For a detailed account of all the operations of the exchanges I would refer to the accompanying report of Professor Baird.

*Explorations, researches, &c.*—It was stated in the last report that the magnetic instruments belonging to the Institution were given in charge of Baron Müller, for investigations in Mexico and Central America. Two series of records of observations have been received, but for nearly a year past nothing further has been heard from the expedition. We should regret the loss of the instruments, although

the cost of them has been more than repaid by the services they have rendered to science in the Arctic expedition under Dr. Kane, and in the results which have already been obtained from them in Mexico.

The self-registering apparatus in the observatory on the Smithsonian grounds, established at the joint expense of the Coast Survey and the Institution, has continued to record the variations in the horizontal direction of the magnetic force during a considerable portion of the past year. The interruptions which have taken place have been principally caused by the impurities of the city gas, the exhalations from which have interfered with the photographic process. The records obtained, however, will furnish valuable data for studying, in connexion with similar observations in other parts of the globe, the character of the magnetic force, and to assist in determining how far the changes are merely local, or to what extent they affect the whole earth.

*Laboratory.*—During the past year the laboratory has been under the charge of Dr. E. W. Hilgard, recently appointed State geologist of Mississippi. Among others, a series of experiments was made by him, under direction of the Secretary, at the expense of the Navy Department, relative to the vapor from a modification of bi-sulphuret of carbon as a substitute for steam applied to mechanical purposes. The result of these investigations was unfavorable to the substitution of this material in the way proposed. Although a greater amount of pressure is produced at the same temperature than in the case of steam, yet the amount of work relative to the absolute quantity of heat employed is by no means in accordance with this, the density of the vapor and its greater specific heat require a corresponding amount of fuel, and when we consider the fact that the bi-sulphuret of carbon is not a natural but a factitious substance, of which the vapor, when combined with air, is highly explosive and extremely offensive on account of its odor and the greater complexity of the engine required for its use, its application in the place of steam would be far from advantageous.

Another series of investigations was conducted in the laboratory relating to the prevention of counterfeiting bank notes, particularly by photography; but as this was intended especially for private use, the expenses were paid by the parties interested.

The Institution does not consider it a part of its duty to volunteer an opinion as to the practicability of the new projects with which the public mind is frequently agitated; but when directly called upon by the government or other parties of influence to pronounce a judgment

on any point of practical or applied science, it does not shrink from the responsibility, but, after diligent and cautious inquiry, gives the conclusions, whatever they may be, at which it has arrived.

*Library.*—Extensive alterations are in the process of being made in the wing of the building appropriated to the library, for the better accommodation of the books. The shelving has been arranged in two stories of alcoves, thereby more than doubling the space. Each lower alcove is separately secured by a door; a precaution which has been found necessary in the library of the Institution as well as in that of Congress. It is a fact to be regretted, but which it is necessary to mention in order to vindicate the restrictions imposed upon an indiscriminate access to the books, that there is in some quarters a lamentable want of honesty with regard to the use of property of a public character. Not only are works in many cases mutilated, merely to avoid the labor of copying a few pages, but valuable sets are sometimes broken by actual theft.

The appropriation for the library must not alone be measured by the sum assigned for the "cost of books;" it must be recollected that the library is principally increasing by means of the exchanges; that every year the Institution sends abroad, besides all the public documents which it can procure, some hundreds of copies of the quarto volumes of its transactions, the marketable value of which is several thousand dollars. It therefore ought to be distinctly understood that the library is constantly increasing by the addition of the most valuable series of the transactions of literary and scientific societies in all parts of the world, and that this is at the expense of what are denominated the active operations of the Institution. It is true the number of books directly purchased is comparatively small; but indirectly procured in the way stated the annual addition is valuable.

Among the numerous donations received during the past year it is of course impossible in this report to particularize more than a few of the most important. The Academies of Science of Vienna, St. Petersburg, and of Brussels, have all contributed largely both of their older and more recent issues. The Real Sociedad Economica, of Havana, has been particularly liberal in this respect, furnishing nearly complete series for many years back, as have also the Horticultural societies of Paris and Berlin. The most extensive single gift during the year has been that of the Dictionnaire des Sciences Naturelles, in 72 volumes, and the Histoire Naturelle des Mammirfèes, of Buffon and Daubenton, in 15 volumes, from the Herzogliche Bibliothek der

Institution have been given in several of the preceding reports, and it will be sufficient, at this time, to repeat that they are intended to exhibit the distribution and development of the plants and animals, as well as to illustrate the geological and mineralogical character of the North American continent. The number of specimens required for these purposes is great, since all the varieties from every locality require attention. During the past year specimens have been collected by ten government expeditions and six private exploration parties. Some of the returns from these are now on the way, and will greatly enhance the number and value of the materials before received. According to the statement of Professor Baird, hereto appended, the catalogued specimens of animals at the end of the year 1857, amounted to: mammals, 3,200; birds, 8,766; skeletons and skulls, 3,340; reptiles, 239; fishes, 613.

During the year several persons have availed themselves of the use of the collections and library in the prosecution of original researches, and, as usual, several government expeditions, which have been sent out for surveys, the construction of roads and for military purposes, have been provided with instructions as to the mode of collecting specimens and observing meteorological and other natural phenomena. No opportunity of adding to our store of information, in regard to the physical geography and natural history of the western portion of this continent, has been suffered to pass without being improved, and I may safely say, that since the establishment of the Institution more has been done to ascertain and make known the character of the less inhabited portion of our continent than all which had been previously accomplished in this line. The survey of routes from the Gulf of Mexico to the Pacific has served of late to add much to our knowledge of Central America, and during the past year the British government has sent out a party for the exploration of the country north of the limits of the United States and between the great lakes and the Pacific ocean. This survey, in connexion with that along the 49th parallel of latitude, now in progress for determining the boundary line between the United States and the British possessions, will add to the natural history of the northern portion of our territory, and will furnish the data necessary to delineate more accurately the great mountain system which determines the climate and physical peculiarities of the western portion of this continent.

*Smithson's personal effects.*—The bequest of James Smithson included all his personal effects, and these were obtained by Hon. Richard Rush,

ve series of rare though minute specimens of mineralogy, of the service of plate of Smithson, and of the portable chemical and ralogical apparatus with which he made his investigations. les the above mentioned articles, the Institution has had in its ssion for several years the library of Smithson, containing 115 nes, and a collection of manuscripts, principally consisting of what d appear to be the materials of a philosophical dictionary. The e collection taken together serves to exhibit the character of the and clearly to indicate his intention as to the nature of the Insti- n to which he gave his name. It serves to strengthen the convic- if anything of this kind were needed, that the proper interpretation e will has been given by the Regents in adopting the plan which s active operations, the discovery of new truths, and a diffusion ese among men, the prominent object of the establishment.

this connexion, it may be interesting to repeat a statement made former report, that the Institution is in possession of two like- s of Smithson; one, a portrait of him while a youth, in the cos- of a student at Oxford, the other a medallion, from which a steel ving has been executed. The first was purchased from the widow hn Fitall, the servant of Smithson, and the other was among his s, and identified by a paper attached to it, on which the words likeness" were written in Smithson's own hand. A list of the rs published by Smithson, and a record of all the facts which l be gathered in relation to him, have been made, to serve here- for a more definite account of his life and labors than has yet ared.

*llery of Art.*—During the past year this apartment of the Smith- n building has been enriched by a faithful copy, in Carrara le, of the "Dying Gladiator," one of the most celebrated statues tiquity. This copy, which is said to be the only one in marble istence, has been deposited here by its owner, F. W. Risque, of the District of Columbia, to whom the public of this country debted for his liberality in the purchase and free exhibition of so

costly and interesting a specimen of art. It is by Joseph Gott, an English sculptor of high reputation, and its faithfulness, as a representation of the original, is vouched for by a certificate, among others, from our lamented countryman, Thomas Crawford.

The Stanley collection of Indian portraits, which is still in the Gallery, has, during the past year, been increased by a number of new pictures, and continues to be an object of interest to the visitors of the national capital. This collection, now the most extensive in existence, of Indian portraits, ought, as we have stated in previous reports, to be purchased by government. It is a sacred duty which this country owes to the civilized world to collect everything relative to the history, the manners and customs, the physical peculiarities, and, in short, all that may tend to illustrate the character and history of the original inhabitants of North America. The duty which Mr. Stanley owes to his family will not permit him to retain the collection unbroken, and unless Congress make an appropriation for its purchase, he will be obliged to dispose of it in portions. Such an event would be a lasting source of regret; and, from the interest which a number of distinguished members of the Senate and House of Representatives have expressed in regard to the purchase, we doubt not that the proposition will in due time be favorably entertained.

*Lectures.*—During the past season the usual number of lectures has been given, without any diminution in the size of the audience and the apparent interest of the public.

In connexion with this subject, we may mention, complaints have frequently been made against the Institution, on account of the bad condition of the walks leading to the building; but it should be recollected that the grounds belong to the government and are not under the control of the Regents. A plank walk has, however, been laid down along the principal thoroughfare and lighted, on nights of lectures, at the expense of the Institution.

The Smithsonian lecture-room is found to be the most commodious apartment in the District for public meetings, and almost constant applications are made for its use. This is granted in all cases, provided the actual expense of lighting, heating and attendance be paid, and the object for which it is required be consistent with the character of the Institution, and not merely intended to advance individual interests. The rule which excludes from the lectures any subject connected with sectarianism, *discussions in Congress* and the political questions of the day, has been strictly observed.

The following is a list of the lectures which were delivered during the winter of 1857–'58:

Seven lectures by Professor John LeConte, of the South Carolina College, on "The Physics of Meteorology."

One lecture by Hon. H. W. Hilliard, of Alabama, on the "Life and Genius of Milton."

Two lectures by Dr. I. I. Hayes, of Philadelphia, on "Arctic Explorations."

One lecture by Rev. T. J. Bowen, of Yoruba, Africa, on "Central Africa—the Country and People."

One lecture by D. K. Whitaker, esq., of Charleston, S. C., on the "Genius and Writings of Sir Walter Scott."

Two lectures by Professor C. C. Felton, of Harvard College, Cambridge, Mass., on "Modern Greece."

Four lectures by Dr. James Wynne, of New York, on the "Duration of Life in Various Occupations."

Three lectures by Professor J. P. Espy, on "The Law of Storms."

Five lectures by Rev. J. H. McIlvaine, of Rochester, N. Y., on "Comparative Philology in some of its bearings upon Ethnology, and embracing an account of the Sanscrit and Persian Arrowhead Languages."

Three lectures by G. Gajani, on "The Catacombs, the Coliseum, and the Vatican of Rome."

One lecture by Professor Schele de Vere, of the University of Virginia, on "John Law and the Celebrated Mississippi Speculation."

From the foregoing statements we think it will be generally acknowledged that the Institution is steadily pursuing a course of usefulness well calculated to make the name of its founder favorably known and the results of his bequest highly appreciated in every part of the civilized world, that its funds are in a good condition, and that the prospect of its future influence in the promotion of knowledge is even more cheering than at any period of its past history.

Respectfully submitted.

JOSEPH HENRY,
*Secretary S. I.*

WASHINGTON, *January*, 1858.

# APPENDIX TO THE REPORT OF THE SECRETARY.

SMITHSONIAN INSTITUTION,
*Washington, December* 31, 1857.

SIR: I have the honor, herewith, to present a report, for 1857, of the operations you have entrusted to my charge, namely, those which relate to the printing, to the exchanges, and to the collections of natural history.

Respectfully submitted.

SPENCER F. BAIRD,
*Assistant Secretary Smithsonian Institution.*

JOSEPH HENRY, LL.D.,
*Secretary Smithsonian Institution.*

## PUBLICATIONS.

The publications of the Institution for the year consist of the ninth volume of Smithsonian Contributions to Knowledge, embracing 484 pages of quarto text and 22 plates, and of the annual report to Congress, an octavo volume of 468 pages. Considerable progress has also been made with the printing of the tenth volume of Smithsonian Contributions, 136 pages and five plates being finished.

The catalogue of North American Diptera, by Baron Ostensacken, is nearly through the press and will include 112 octavo pages.

## EXCHANGES.

The system of international exchanges so successfully prosecuted by the Institution since its establishment has been carried on during the year with the happiest results. A large amount of scientific material has passed through its hands and has been promptly transmitted to its destination. The general details of the system will be presented hereafter.

The returns made to the Smithsonian Institution for its own donations will be found in the following table:

A.—*Receipt of books, &c., by exchange in* 1857.

| | | |
|---|---|---|
| Volumes—Octavo | 404 | |
| Quarto | 146 | |
| Folio | 5 | |
| | | 555 |
| Parts of volumes and pamphlets— | | |
| Octavo | 775 | |
| Quarto | 255 | |
| Folio | 37 | |
| | | 1,067 |
| Charts and maps | | 138 |
| | | 1,760 |

The works received embrace most of the current volumes of scientific transactions, with some back series, and are of the highest importance as materials of scientific research.

In the following tables are exhibited the chief statistics of exchange during both 1856 and 1857. The last annual report did not fully cover the subject, owing to the fact that a supplementary sending was required in January, 1857, to complete that of July, 1856, and a report for 1856 could not reasonably include what was actually not performed till the ensuing year. In presenting the series of tables throughout, those of transmissions for 1856 are to be understood as embracing parcels forwarded in January 1857. This will explain the apparent disproportion in amount for the two years, as much of what was sent in the beginning of 1857 would otherwise not have gone until the ensuing summer.

B.

*Table showing the statistics of foreign exchanges of the Smithsonian Institution in 1856.*

| Distributed through— | Principal addresses of parcels. | Addresses of sub-parcels inclosed. | Total of addresses. | Number of principal packages. | Number of sub parcels inclosed. | Total of parcels. | Number of boxes used. | Bulk of boxes in feet. | Weight of boxes in pounds. |
|---|---|---|---|---|---|---|---|---|---|
| 1. *Dr. F. Flügel, Leipsic.* | | | | | | | | | |
| Sweden | 8 | 21 | ..... | 22 | 25 | ..... | ..... | ..... | ..... |
| Norway | 5 | 7 | ..... | 13 | 7 | ..... | ..... | ..... | ..... |
| Iceland | 1 | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... |
| Denmark | 6 | 19 | ..... | 17 | 25 | ..... | ..... | ..... | ..... |
| Russia | 25 | 29 | ..... | 73 | 32 | ..... | ..... | ..... | ..... |
| Holland | 17 | 17 | ..... | 46 | 18 | ..... | ..... | ..... | ..... |
| Germany | 155 | 193 | ..... | 414 | 240 | ..... | ..... | ..... | ..... |
| Switzerland | 15 | 20 | ..... | 39 | 21 | ..... | ..... | ..... | ..... |
| Belgium | 9 | 15 | ..... | 29 | 18 | ..... | ..... | ..... | ..... |
| Total | 241 | 321 | 562 | 656 | 386 | 1,042 | 42 | 340 | 10,428 |
| 2. *H. Boisange, Paris.* | | | | | | | | | |
| France | 79 | 120 | ..... | 187 | 142 | ..... | ..... | ..... | ..... |
| Italy | 42 | 33 | ..... | 95 | 33 | ..... | ..... | ..... | ..... |
| Spain and Portugal | 6 | 1 | ..... | 14 | 1 | ..... | ..... | ..... | ..... |
| Total | 127 | 154 | 281 | 296 | 176 | 472 | 13 | 126 | 4,129 |
| 3. *The Royal Society and H. Stevens, London.* | | | | | | | | | |
| Great Britain and Ireland | 117 | 231 | 348 | 260 | 253 | 513 | 9 | 94 | 2,914 |
| 4. *Other channels* | 26 | 10 | 36 | 39 | 10 | 49 | 6 | 26 | 800 |
| Grand total | 511 | 716 | 1,227 | 1,251 | 825 | 2,076 | 70 | 586 | 18,271 |

## C.

*Table showing the statistics of foreign exchanges of the Smithsonian Institution in* 1857.

| Distributed through— | Principal addresses of parcels. | Addresses of sub-parcels inclosed. | Total of addresses. | Number of principal packages. | Number of sub-parcels inclosed. | Total of parcels. | Number of boxes used. | Bulk of boxes in cubic feet. | Weight of boxes in pounds. |
|---|---|---|---|---|---|---|---|---|---|
| 1. *Dr. F. Flügel, Leipsic.* | | | | | | | | | |
| Sweden | 9 | 15 | ..... | 22 | 23 | ..... | ..... | ..... | ..... |
| Norway | 5 | 4 | ..... | 10 | 7 | ..... | ..... | ..... | ..... |
| Iceland | 1 | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... |
| Denmark | 6 | 10 | ..... | 12 | 16 | ..... | ..... | ..... | ..... |
| Russia | 25 | 20 | ..... | 47 | 37 | ..... | ..... | ..... | ..... |
| Holland | 17 | 9 | ..... | 32 | 12 | ..... | ..... | ..... | ..... |
| Germany | 142 | 160 | ..... | 293 | 232 | ..... | ..... | ..... | ..... |
| Switzerland | 15 | 20 | ..... | 28 | 26 | ..... | ..... | ..... | ..... |
| Belgium | 7 | 16 | ..... | 18 | 29 | ..... | ..... | ..... | ..... |
| Total | 227 | 254 | 481 | 465 | 382 | 847 | 19 | 183 | 6,928 |
| 2. *H. Bossange, Paris.* | | | | | | | | | |
| France | 69 | 63 | ..... | 114 | 77 | ..... | ..... | ..... | ..... |
| Italy | 32 | 24 | ..... | 51 | 32 | ..... | ..... | ..... | ..... |
| Spain | 5 | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... |
| Portugal | 2 | 1 | ..... | 3 | 1 | ..... | ..... | ..... | ..... |
| Total | 108 | 88 | 196 | 178 | 110 | 288 | 6 | 63 | 2,410 |
| 3. *The Royal Society and H. Stevens, London.* | | | | | | | | | |
| Great Britain and Ireland | 121 | 108 | 229 | 232 | 158 | 390 | 10 | 118 | 3,910 |
| 4. *Other channels* | 49 | 10 | 59 | 90 | 10 | 100 | 5 | 20 | 1,000 |
| Grand total | 505 | 460 | 965 | 965 | 660 | 1,625 | 40 | 384 | 14,248 |

D.—*Packages received by the Smithsonian Institution for foreign distribution in* 1856 *and* 1857.

| | No. of packages | |
|---|---|---|
| | 1856. | 1857. |
| *Albany, N. Y.*— | | |
| New York State Agricultural Society | 5 | 43 |
| New York State Medical Society | 6 | ..... |
| Prof. James Hall | 8 | ..... |
| *Baltimore, Md.*— | | |
| Philip R. Uhler | 25 | ..... |
| *Baton Rouge, La.*— | | |
| Institution for Mutes and Blind | 18 | ..... |
| *Boston, Mass.*— | | |
| American Academy of Arts and Sciences | 392 | 98 |
| Boston Society of Natural History | 65 | 56 |
| Historic-Genealogical Society | 1 | ..... |
| Prison Discipline Society | 32 | ..... |
| Dr. Warren | 5 | ..... |
| B. Homer Dixon | ..... | 7 |
| W. H. Dixon | 5 | ..... |
| Ed. Jarvis | ..... | 84 |
| Ed. Tuckerman | ..... | 10 |
| W. H. Prescott | 8 | ..... |
| Heirs of Amos Binney, M. D | ..... | 49 |
| *Cambridge, Mass.*— | | |
| American Association for Advancement of Science | 28 | ..... |
| Cambridge Observatory | ..... | 210 |
| J. D. Runkle | 50 | ..... |
| Prof. Asa Gray | 1 | 32 |
| Prof. D. Treadwell | 200 | ..... |
| *Charleston, S. C.*— | | |
| Dr H. W. Ravenel | 2 | ..... |
| *Chicago, Ill.*— | | |
| Col. J. D. Graham, U. S. A | ..... | 66 |
| *Cincinnati, Ohio*— | | |
| M. L. Knapp, M. D | 24 | ..... |
| D. Vaughan | 24 | ..... |
| *Columbus, Ohio*— | | |
| Ohio State Board of Agriculture | ..... | 274 |
| *Frankfort, Ky.*— | | |
| Geological Survey of Kentucky | ..... | 50 |
| *Georgetown, D. C.*— | | |
| Georgetown College | 2 | ..... |
| *Granada, Nicaragua*— | | |
| President Rivas | 100 | ..... |
| *Hartford, Conn.*— | | |
| Hon. Henry Barnard | 283 | ..... |
| Mr. Potter | 22 | ..... |
| *Lansing, Mich.*— | | |
| Michigan State Agricultural Society | 50 | ..... |
| *Lebanon, Tenn.*— | | |
| Prof. Safford | ..... | 6 |
| *Lowell, Mass.*— | | |
| James B. Francis | 16 | ..... |
| *Madison, Wis.*— | | |
| Wisconsin State Agricultural Society | ..... | 14 |
| Historical Society of Wisconsin | ..... | 40 |
| *New Brunswick, N. J.*— | | |
| Prof. Geo H. Cook | ..... | 5 |

## D—Continued.

| | No. of packages. | |
|---|---|---|
| | 1856. | 1857. |
| *New Haven, Conn.*— | | |
| American Journal of Science | 48 | 20 |
| American Oriental Society | 4 | ..... |
| Prof. D. Olmsted | 10 | 7 |
| *New York*— | | |
| American Geographical and Statistical Society | ..... | 57 |
| New York Lyceum of Natural History | 86 | ..... |
| Prof. W. Gibbs | ..... | 90 |
| *Philadelphia, Pa.*— | | |
| American Philosophical Society | 42 | 79 |
| Academy of Natural Sciences | 300 | 173 |
| Central High School of Philadelphia | 100 | 100 |
| Historical Society of Pennsylvania | 4 | ..... |
| Pennsylvania Institute for the Blind | 45 | 53 |
| Philadelphia Library Company | 19 | ..... |
| Dr. Horner, U. S. N | 100 | ..... |
| Isaac Lea | 171 | 178 |
| Dr. Joseph Leidy | 134 | 47 |
| Dr. J. A. Meigs | ..... | 44 |
| *Providence, R. I*— | | |
| State of Rhode Island | ..... | 6 |
| *St. Louis, Mo*— | | |
| St. Louis Academy of Science | ..... | 161 |
| Dr. B. F. Shumard | 12 | ..... |
| *San Francisco, Cal*— | | |
| California Academy of Natural Sciences | 50 | ..... |
| *Santiago, Chile*— | | |
| University of Chile | 140 | ..... |
| *Savannah, Ga*— | | |
| Dr. Jos. Jones | 50 | ..... |
| *Toronto, Canada*— | | |
| Canadian Institute | ..... | 17 |
| *Washington, D. C.*— | | |
| U. S. Patent Office | 250 | 250 |
| Ordnance Bureau | 46 | ..... |
| U S Coast Survey | 67 | 497 |
| National Observatory | ..... | 73 |
| Light-House Board | 3 | ..... |
| Secretary of War | 120 | 114 |
| Surgeon General | ..... | 50 |
| Major W. H. Emory, U. S. A | 96 | ..... |
| W. P. Blake | 50 | ..... |
| Dr. J. S. Newberry | 20 | ..... |
| Lieut. J. C. Ives, U. S. A | 18 | ..... |
| Lieut. G. K. Warren, U. S. A | 20 | ..... |
| Lieut. J. M. Gilliss, U. S. N | ..... | 25 |
| Wm. Stimpson | ..... | 50 |
| J. C. G. Kennedy | ..... | 50 |
| W. J. Rhees | ..... | 100 |
| Miscellaneous | 133 | 120 |
| Total | 3,510 | 3,397 |
| Supposing each parcel to contain an average of one and a half pieces, the number of these would be | 5,265 | 5,095 |
| Add of Smithsonian volumes and memoirs, about | 2,500 | 2,500 |
| Add volumes of public documents obtained and distributed, about | 1,500 | 1,000 |
| Approximate total of volumes and pamphlets sent abroad by the Institution | 9,265 | 8,595 |

—*Addressed packages received by the Smithsonian Institution from Europe, for distribution in America.*

| | No. of packages. | |
|---|---|---|
| | 1856. | 1857. |
| *any, N. Y.*— | | |
| New York State Library | 9 | 9 |
| *ton, Mass.*— | | |
| American Academy of Arts and Sciences | 42 | 53 |
| Boston Society of Natural History | 30 | 39 |
| Bowditch Library | 1 | -------- |
| *bridge, Mass.*— | | |
| American Association for Advancement of Science | 7 | 7 |
| Cambridge Astronomical Journal | 24 | 19 |
| Cambridge Observatory | 9 | 9 |
| Harvard College | 22 | 19 |
| *rleston, S. C.*— | | |
| Literary and Philosophical Society | 2 | -------- |
| *mbus, Ohio*— | | |
| Ohio State Board of Agriculture | 14 | 24 |
| *rgetown, D. C.*— | | |
| Georgetown College | 3 | -------- |
| *sing, Mich.*— | | |
| Michigan State Agricultural Society | 8 | 13 |
| *dison, Wis*— | | |
| Wisconsin State Agricultural Society | 22 | 22 |
| *v Haven, Conn.*— | | |
| American Journal of Science | 5 | 5 |
| American Oriental Society | 1 | -------- |
| *v Orleans, La.*— | | |
| New Orleans Academy of Natural Sciences | 12 | 16 |
| *v York*— | | |
| American Geographical and Statistical Society | 24 | 19 |
| New York Lyceum of Natural History | 24 | 25 |
| *ladelphia, Pa.*— | | |
| American Philosophical Society | 74 | 55 |
| Academy of Natural Sciences | 57 | 62 |
| Franklin Institute | 9 | 7 |
| *Francisco, Cal.*— | | |
| California Academy of Natural Sciences | 4 | 19 |
| *tiago. Chile*— | | |
| University of Chile | 1 | 6 |
| Observatory | 2 | 7 |
| *shington, D. C.*— | | |
| U. S. Patent Office | 37 | 57 |
| National Institute | 3 | 3 |
| Bureau of Ordnance and Hydrography | 1 | 3 |
| U. S. Coast Survey | 27 | 24 |
| National Observatory | 23 | 63 |
| Surgeon General | 1 | -------- |
| United States Agricultural Society | 2 | -------- |
| Library of Congress | 17 | 10 |
| *rcester, Mass*— | | |
| American Antiquarian Society | 1 | -------- |
| cellaneous addresses, institutions | 437 | 330 |
| Individuals | 318 | 320 |
| Total | 1,245 | 1,273 |

n addition to the above, 142 volumes were received from five European institutions for tribution to such addresses as might be selected by the Smithsonian.

## DETAILS OF THE SYSTEM OF EXCHANGES.

As the system of international exchange now carried on by the Smithsonian Institution has attained a very great development, a sketch of the mode of conducting it may not be amiss at the present time. The subject may be considered under two heads, one relating to the parcels received from parties in the United States for transmission to foreign countries, and the other having reference to receipts from abroad for institutions and individuals in America. In connexion with this subject, it may be stated that a large room in the Institution, measuring 70 feet by about 25, is devoted to the department of exchanges, and, besides containing the stock on hand of Smithsonian publications and of miscellaneous documents, is fitted up on one side with a series of large binns, each one devoted to a particular portion of the world, and appropriately labelled. The floor of the room is occupied by a series of long tables, five feet wide, on which parcels are made up or unpacked. Printed addresses are arranged in small pigeon holes, and include nearly all the correspondents of the Institution, domestic and foreign, amounting, at the present time, to nearly one thousand names.

*Operations connected with transmissions from the United States.*—The transmissions of the Smithsonian Institution are regulated, in a measure, by the time when the annual volume of Smithsonian Contributions is completed. One or two months before this time, a circular letter of advice is transmitted to all the institutions and individuals in the United States and the Canadas known or supposed to have a desire to avail themselves of the facilities of the Smithsonian system of exchanges, and the conditions stated upon which parcels will be received. If any society or individual have published a work likely to be of interest to the scientific and literary world abroad, and no indication is given of an intention to distribute copies, a special application is made for them, and no effort left untried to secure to the foreign investigators the benefit of all original and useful American material. Such appeals are generally responded to very favorably, and very many publications of the different bureaus of the government, of States, and of State agricultural and historical institutions, of societies, and of individuals, have thus been obtained.

In nearly all cases, in the first instance, at least, the Smithsonian Institution is called on to furnish lists of suitable foreign recipients for the publications just referred to, or the volumes are sent in bulk, to be addressed here. After the first sending, the exchange is usually more directly between the parties corresponding, the Institution preferring to have the parcels properly addressed before forwarding to Washington. In all cases great care is taken to secure the credit of the donation to the proper party, and to prevent it being supposed to come directly from the Institution.

To facilitate the selection of suitable recipients for donations or exchanges, the Institution publishes once in two years a carefully prepared list of foreign institutions for general distribution. The last one issued contains over 570 names, but manuscript additions bring

the number up to about 700. The list of individuals is nearly as large as that of institutions.

To facilitate the selection of recipients for particular works, of which a limited number of copies only may be available for distribution, classified lists of institutions are kept, as of academies of science generally, and of societies devoted to special subjects, as geography, geology, zoology, botany, ethnology, statistics, &c., and these are arranged from No. 1 upwards, in the order of relative importance, or of equable distribution among the centres of learning; thus six copies of any work on hand would be assigned to the first six names on the list of institutions most interested in it.

The parcels, as received from the different portions of North America, are placed, after being addressed, (if not so already,) in their appropriate receptacles, and the list entered specifically in a record book. To facilitate such entry, a detailed invoice of each transmission is required, and the failure to furnish it puts the institution to the great trouble of making it from the books themselves.

When the parcels have all been received, a list of the different donors is printed, together with the titles of the various works which the institution has for distribution at the time. On the day assigned for commencing the labor of making up the packages, the binns are emptied successively, the contents arranged carefully on the counters, so as to bring everything for one address together, the Smithsonian donations are added, and each particular piece is checked off in the printed blank just referred to. This rough invoice is numbered and handed to the packers, who make up the volumes into one or more bundles, and mark them with the number of the invoice, by which means they are easily identified and labelled. When parcels or books are addressed to individuals, these are usually inclosed in the bundles of the societies to which they belong, the number and addresses of such sub-packages being marked on the rough invoices. A correct copy is made of these lists, and forwarded by mail or otherwise to the parties, in which is also stated the nature and time of the transmission. These invoices are finally posted, to the debit of the party addressed, in a large ledger, which shows what each has had, and what return has been made to the Institution. The record of each package is, therefore, made four times.

In sending the invoice of the package for each address, a circular is added explaining the objects of the transmission, and the conditions on which the exchange will be continued.

The time occupied in invoicing and making up the packages varies with the occasion, although a month is usually required to finish the work. After the bundles are all made up, those for each agent are brought into one heap, and they are then packed into boxes, a check list being kept of the numbers placed in each box.

There are three principal agents in Europe who have charge of the Smithsonian exchanges in their respective regions: Dr. Felix Flügel, resident in Leipsic, has charge of continental Europe, with the exception of France, Italy, Spain, and Portugal, (which are supplied by Hector Bossange, of Paris,) and of Greece and Turkey. Henry Stevens, of London, is agent for Great Britain and Ireland. Greece

10. *Exploration of the Colorado river, under Lieutenant J. C. Ives.*—This expedition started in September, accompanied by Dr. J. S. Newberry, surgeon and geologist, and H. B. Möllhausen, artist and zoologist. Several collections made by these gentlemen about San Diego are on their way, but have not yet been received.

The more important private explorations from which specimens have been received are as follows:

11. *Region around Fort Tejon, California, by J. Xantus de Vesey.*—The collections made by Mr. Vesey will compare favorably with any obtained under government auspices, and embrace complete series of the animals and plants of the vicinity of Fort Tejon, as far as met with; they also include quite a number of new species.

12. *Southern Illinois and Northern Red river, by R. Kennicott.*—Mr. Kennicott, under a commission from the Northwestern University, at Evanston, Illinois, to procure for its museum a collection of specimens of the natural history of the northwest, visited southern Illinois in the spring, and after exploring the vicinity of Cairo and New Madrid for several months, proceeded to the Red river of the North, within the British possessions, and nearly to Lake Winipeg. The collections made cover all branches of zoology.

13. *Coast of Florida, by G. Wurdemann, United States Coast Survey.*—Mr. Wurdemann's collections were in continuation of those of previous years, and included a great variety of species, among them several birds new to the fauna of the United States.

14. *Red river of the North and of Nelson's river, H. B. Territory, by Donald Gunn, esq.*—A large collection of birds and mammals made in these regions by Mr. Gunn, assisted by Mr. John Isbister, have added much to our knowledge of the distribution of species.

A collection of about 150 species of birds of Arctic America, Mexico, and Guatemala, presented by John Gould, esq., of London, has furnished very important data for comparison and determination of species of the United States.

Of the numerous other collections made it is impossible to give an account here. The detailed list of contributions and donations will, however, furnish additional information on the subject.

In conclusion it may be proper to state, that of the government expeditions mentioned above, that under Mr. Campbell was organized by the State Department; those under Lieutenant Warren, Lieutenant Bryan, Colonel Johnston, Captain Pope, and Lieutenant Ives, by the War Department; those under Mr. Magraw and Mr. Leech, by the Department of the Interior; and those under Captain Page and Lieutenant Michler, by the Navy Department.

In the reception of collections from the California coast, the Institution is under great obligations to the California Mail Steamship Line, composed of the United States Mail Steamship Company, the

ıa Railroad Company, and the Pacific Steamship Company, as Messrs. Wells, Fargo, Co., for free transportation of very many ınd packages. The expense of what has been thus received, if d for at the usual rate, would have been entirely beyond the of the Institution, and if in an unprecedentedly short time our ɛdge of the natural history of California has been carried to a ully equal to that of any of the older States, it is unquestionably in very great measure to the liberality of the companies above ned in so generously seconding the efforts of the Institution.

*lowing table exhibits the additions made to the record books of the museum in* 1857, *in continuation of previous years:*

| | 1851. | 1852. | 1853. | 1854. | 1855. | 1856. | 1857. |
|---|---|---|---|---|---|---|---|
| ı | None. | 114 | 198 | 351 | 1,200 | 2,046 | 3,200 |
| | | | | 4,353 | 4,425 | 5,855 | 8,766 |
| ı and skulls | 911 | 1,074 | 1,190 | 1,275 | 2,050 | 3,060 | 3,340 |
| | | | | | | 106 | 239 |
| | | | | | | 155 | 613 |

*Present condition of the museum.*

remarks in the last annual report of the Institution in relation richness and extent of its collections are strengthened by the ns of the past year, and they are confidently believed to be competition in the field of American zoology. The precise cs cannot now be given for the different classes and orders, as aloguing is not yet completed. In one department, however, lea of the facts may be realized by the statement, that on the July, 1857, the Institution possessed—

| | Species. | |
|---|---|---|
| or alcoholic specimens of North American mammals | 205 | |
| or alcoholic specimens of South American mammals | 18 | |
| or alcoholic specimens of European mammals | 60 | |
| | | 283 |
| or skeletons of North American mammals | 221 | |
| or skeletons of South American mammals | 17 | |
| or skeletons of European mammals | 48 | |
| | | 286 |

was entirely exclusive of Cetacea, Pinnipedia, Cheiroptera and ımana, of which there were many species. Since the first of he number of species of all orders has received a large increase. ecies of North American mammals in the museum of the In- n, not mentioned in the great work of Audubon and Bachman, ı 80. Of birds, the North American species are believed to ex- 0; of reptiles, 400; of fishes, probably 800 or more. As all lasses are in process of elaboration, accurate statistics can ly be presented in the next report.

*Work done in the museum.*

The systematic registration of the Smithsonian collections has been carried on as rapidly as other duties would admit. The number of species labeled and entered during the year amounted to 5,271; most of them in three different series of records, making nearly 15,000 entries. It may be proper to state that all collections, as received, are entered in a general record book, of which the alphabetical list of donations appended to this report is a transcript. The different specimens are next labeled and then entered on the record for the class, or particular order, and from this posted in a ledger consisting of separate sheets, one for each species, systematically arranged, and each sheet containing an enumeration of all the specimens of its species, with the localities, sex, date, measurements and other memoranda, making the third time of writing out the name and statistics. In this way not only can information be obtained of the number of species of each class or order, but also of the separate specimens, with the locality and general character of each one. The posting up is complete for the mammals, birds, and osteological specimens, and well under way for the reptiles and fishes, and some orders of invertebrates.

During the past year the general report on the mammals of the Smithsonian collection has been completed and printed, forming volume VIII of the Report of the Pacific Railroad Survey. That on the birds is far advanced, and will be finished in the course of the ensuing year, which will also, it is hoped, witness the completion of reports on the reptiles and fishes.

*Distribution and use of the Smithsonian collections.*

As in previous years, the Smithsonian specimens have been freely used by students and investigators in natural history, in preparation of Monographs and other researches. Duplicates have also been distributed to a considerable extent, and as the collections become better arranged and other circumstances allow, it is hoped to make such distribution on a very extensive scale.

*List of Donations during the year* 1857.

*C. Bellmann.*—Fishes, &c., in alcohol, from Mississippi.

*J. and A. Brakeley.*—Fresh deer and otter from Virginia; jar of birds, mammals and reptiles from the Alleghenies of Virginia.

*J. Mason Brown.*—Cast of the skull of Daniel Boone, taken previous to the re-interment of his remains.

*Lieutenant F. T. Bryan, U. S. A.*—Three boxes of zoological specimens collected by William S. Wood on the wagon-road expedition from Fort Riley to Bridger's Pass.

*Archibald Campbell.*—One box of dried skins, and one chest of alcoholic specimens collected on Puget Sound by Dr. Kennerly, on the northwest boundary survey.

*J. H. Clark.*—Chest with two cans filled with reptiles, fishes and

mammals in alcohol; specimens of salt from the salt plains of the Pewsa, on the southern boundary of Kansas.

*Mr. Cook.*—Copper ores from Arizona.

*Dr. J. G. Cooper.*—Collections made near Fort Laramie, and thence to Independence; four bottles of Salamanders from New Jersey; one hundred skins of birds from California and Washington Territory.

*L. Coulon.*—Box of Swiss mammals.

*Dr. S. Wylie Crawford, U. S. A.*—Thirty-two jars of reptiles and mammals from Texas and New Mexico.

*Benjamin Cross.*—Golden eagle in the flesh (length 36¼ inches; extent, 86 inches; wing, 25 inches.)

*J. P. Cunningham.*—Box of Kaolin earth from Virginia.

*John Day.*—Snake from Virginia.

*T. C. Downie.*—*Coluber couperi* and *Geomys pinetis*, in alcohol, from Georgia.

*C. Drexler.*—Skins of six birds and three mammals from near Philadelphia.

*Dr. J. Evans.*—Ten boxes and one bundle of collections of geological survey of Oregon; skins and skull of *Felis concolor* (panther;) six skulls of Flathead Indians, from Oregon.

*James Fairie.*—25 skins of *Lepus aquaticus* (marsh hare) and *Sciurus ludovicianus* (Fox squirrel;) birds, reptiles in alcohol, from Louisiana.

*A. B. Forbes.*—*Viviparous* fish (*Ennichthys megalops*) from California.

*Professor C. G. Forshey.*—Cast skin of *Scotophis*, and skin of mouse, from Texas; specimens of supposed equine fossil foot-marks; jar of alcoholic specimens; skins of serpents; dried plants; skin of Ocelot and of Raccoons from Fayette county, Texas.

*W. H. Gantt, M. D.*—Infusorial earth from Texas.

*O. E. Garrison.*—Six packages Infusorial earth; skins of *Putorius richardsonii* and *Spermophilus 13-lineatus* from Minnesota.

*Dr. W. Gesner.*—Jar of *Geomys pinetis* and *Arvicola;* mammals and reptiles in alcohol; two jars of mammals from Georgia.

*George Gibbs.*—Box and barrel containing skeleton of large shark, from Port Townsend, W. T.; keg of fishes, from Puget Sound; keg of fishes from Columbia river.

*Dr. J. B. Gilpin.*—Skins of mammals from Nova Scotia; fifteen skins of *Putorius* and *Sciurus* from Labrador and Nova Scotia; jar with 12 mammals, in alcohol, from Nova Scotia.

*W. R. Goodman.*—Diatomaceous earth from Anne Arundel county, Maryland.

*John Gould.*—160 skins of birds of Mexico and Guatemala; skins of humming birds, (*Campylopterus delattrii*, *Trochilus heteropogon* and *Eriopus luciani;*) skins of *Apternus hirsutus* and *arcticus*.

*Donald Gunn.*—Skins of mammals and birds; skeletons; specimens in alcohol from Red river. Skeletons of male and female wolverine from Red river, H. B. T.

*Dr. W. A. Hammond, U. S. A.*—Box of skins of birds and mammals from Kansas. Chest and two cans of zoological specimens collected during Lieut. Bryan's wagon-road expedition to Bridger's Pass.

*Dr. W. A. Hammond* and *J. X. de Vesey*.—Skins of twenty-four birds and of two prairie wolves from Kansas.

*Dr. E. W. Harker*.—Skin of Salamander (*Geomys pinetis?*) from Georgia.

*F. V. Hayden*.—Six boxes of fossils collected in the Upper Missouri prior to 1856.

*C. J. Heistand*.—Specimens in alcohol of squirrels, moles, &c., from Pennsylvania.

*Dr. E. W. Hilgard*.—Specimen of *Carocolla* from Spain.

*John S. Hittel*.—Human skulls and bones encrusted in stalagmite, from a cave in Calaveras county, Cal.

*Col. Hoffman, U. S. A*.—Concretions from Cannon-Ball river, Nebraska.

*B. A. Hoopes*.—Can of *Menobranchus* and small mammals from Lake Superior.

*Robert Howell*.—Two cans of mammals, in alcohol, from Tioga county, N. Y.

*Lieut. J. C. Ives, U. S. A*.—Fossil *Dendrechinus excentricus*, Point Lobas, Cal.; miscellaneous fossils from California; fossils from Gatun, N. G.—all collected by Dr. J. S. Newberry.

*Dr. R W. Jeffrey, U. S. N*.—Collection of fishes of Norfolk.

*Col. E. B. Jewett*.—Reptiles from Texas.

*Dr. C. B. Kennerly*.—Jar of mammals in alcohol, and skins of *Sciurus cinereus*, from Clark county, Va.

*Robt. Kennicott*.—Six boxes zoological collections made in southern Illinois, and in Minnesota to Lake Winipeg. (Deposited.) Gopher (*Geomys bursarius*) from Illinois; thirty skins of *Arvicola* and *Sorex* from Illinois; two living squirrels, (*Sciurus ludovicianus*.)

*Major Jno. Leconte*.—*Astacus latimanus* from Georgia.

*J. MacMinn*.—Skins of five mammals from Pennsylvania.

*Wm. M. Magraw*.—Box of skins of birds and mammals; plants from Independence; three boxes zoological collections, plants, &c., gathered between Fort Leavenworth and Fort Laramie during the South Pass wagon-road expedition. Collected by Dr. J. G. Cooper.

*Geo. P. Marsh*.—Minerals from Europe.

*C. C. Martin*.—Keg of reptiles, fish and mammals, from Pennsylvania and New York.

*W. Massenburn*.—Collections of serpents and crustacea from Florida.

*Maximilian Prinz Von Wied*.—Wild boar (*Sus scrofa*) from Germany, and skins of chamois (*Capella rupricapra*) and of female ibex (*Capra ibex*) from Mont Blanc.

*Dr. E. Michener*.—Mounted original of *Emberiza townsendii*. (Deposited.)

*D. Miller, jr*.—Thirty small mammals, in alcohol, from Pennsylvania.

*Robt. O. Milton*.—Box of fossils from Michigan.

*H. B. Möllhausen*.—Skin of head and skull, with horns, of European stag, (*Cervus elaphus*.)

*W. E. Moore*.—Skins of monkeys from Bolivia

*Henry Moores*.—Star fishes from California. (Deposited.)

*H. M. Neisler.*—Shells, reptiles, fishes, &c., in alcohol, from Georgia.

*Dr. J. S. Newberry.*—Box of shells, Acapulco; specimens of coals from Ohio.

*New Orleans Academy of Sciences.*—Skin of pouched rat (*Geomys pinetis*) from Florida.

*B. M. Norman.*—Three living turtles from New Orleans, (*Emy mobilensis?*)

*B. F. Odell.*—Mammals and reptiles from near Lake Winnibigoshish, Minnesota.

*John Oliphant.*—*Falco sparverius*, in flesh, from Maryland.

*Capt. T. J. Page, U. S. N.*—Two packages of maté and six bottles of water from the Rio Negro and Mato Grosso.

*Dr. D. W. C. Peters.*—Skins, birds, and mammals; reptiles and fishes, in alcohol, from New Mexico.

*Thos. M. Peters.*—Bottle of reptiles; skin of *Abastor erythrogrammus* from Alabama.

*Prof. Poey.*—Two living *Emys decussata;* living boa or maja, (*Epicrates angulifer;*) collection of reptiles, in alcohol, from Cuba.

*J. P. Postell.*—Two living Gophers, (*Testudo polyphemus;*) skull of *Geomys pinetis;* box of shells, and other invertebrata, from Georgia.

*John Potts.*—Skins of *Bassaris astuta*, *Putorius frenatus* and *Didelphys californica*, from the city of Mexico.

*Francis B. Ray.*—Bottle containing *Ophibolus eximius* from Missouri.

*E. Raymond.*—Fossil wood from Neuse river, North Carolina.

*J. W. Raymond.*—Skin of white raccoon from North Carolina, and of *Bassaris astuta* from California.

*Peter Reid.*—Fresh water sponge, in alcohol, from near Lake Champlain.

*Rev. Jos. Rowell.*—Monkeys and other mammals, fishes, &c., in alcohol.

*H. de Saussure.*—Four bats, *Sorex alpinus*, *Myoxus glis*, *Mus sylvaticus*, and *musculus*, and *Arvicola nivalis* from the St. Gothard, Switzerland; other small mammals of Switzerland.

*S. H. Scudder.*—Can of mammals, in alcohol; box of insects from Massachusetts.

*Lieut. Semmes, U. S. N.*—Syenite from North Greenland.

*J. D. Sergeant.*—Jar of mammals from Pennsylvania.

*James Shoemaker.*—Snakes and fishes from Roanoke county, Va.

*Col. Wm. B. Slaughter.*—Peat from Wisconsin.

*J. Stauffer.*—Can of mammals, in alcohol, from Pennsylvania.

*J. J. Steenstrup*, Director of Zoological Museum, Copenhagen.—Six jars of invertebrates from Greenland

*J. H. Sternberg.*—Four turtles; two boxes of shells, and of reptiles and invertebrates, in alcohol; box of living plants from Isthmus of Panama.

*William Stimpson.*—Two kegs and numerous jars of marine invertebrates and fishes from Massachusetts; living marine animals for aquarium.

*Dr. George Suckley.*—Hunters' skin of elk and of mountain goat,

*Aplocerus montanus*, from Washington Territory; box of birds from California; skins of mammals, birds; fishes, shells, minerals, and Indian relics, from Washington Territory; box with skins of mammals and birds; plants, &c., from Steilacoom; box of birds, shells, &c., Port Townsend.

*A. S. Taylor.*—Jar of vertebrates and crabs from California; California minerals.

*Mr. Tufts.*—Living actinia and other marine animals for aquarium.

*Colonel A. Vaughan.*—Skins of *Vespertilio noctivagans* and *noveboracensis* from Yellowstone river.

*J. X. de Vesey* and *Dr. W. A. Hammond, U. S. A.*—Skins of birds and mammals from Kansas.

*Dr. D. S. Wall, U. S. A.*—Skull of Indian and fragments of pottery from a mound near Fort Capron, Florida; skins of birds; skin of manatee, or sea-cow, and of *Lynx;* also two birds from Florida.

*William D. Wallach.*—Copper ores and native copper from Bayfield, Wisconsin.

*Robert B. Waller.*—Bottle of Cyprinodonts from Alabama.

*Lieutenant G. K. Warren.*—Two boxes fossils from Blackbird Hill, collected by Dr. F. V. Hayden; collections made by Dr. F. V. Hayden during the exploration of the Black hills in 1857, consisting of 5 boxes zoological specimens; 21 boxes fossils and plants, &c.

*C. W. Welch.*—Troupial (*Icterus vulgaris*) from Laguayra.

*D. Welch.*—*Menobranchus maculatus* from Lake Champlain.

*Samuel Wheat.*—Living black snake (*Scotophis allegheniensis*) from Ohio.

*Mr. Wheeler.*—*Storeria dekayi* from Washington.

*Thomas Whelpley*—Fossils from Michigan.

*Dr. D. D. Whitehurst.*—Box of specimens and cask of fishes, &c., in alcohol, from Gulf of Mexico; specimens of fishes (crustacea) from Tortugas.

*Dr. S. W. Wilson.*—Four living alligators from Georgia; skeleton and skins of otter and deer; skins of *Lepus palustris;* 24 small mammals, in alcohol, from Georgia.

*Dr. C. F. Winslow.*—Box of lavas from Sandwich Islands; fossil bones from California. (Deposited.)

*W. S. Wood.*—Bald eagle, *Haliaetus leucocephalus*, mounted; mammals, in alcohol, from Philadelphia.

*C. Wright.*—Jar mammals and reptiles from Connecticut; fishes from Cuba, said to be viviparous; jars of reptiles, fishes, and invertebrates from Cuba.

*G. Würdemann.*—Box of invertebrates and skins of birds from Indian Key, Florida; box of bird skins from south Florida; box of birds, crustacea, corals, &c., from Key Biscayne, Florida.

*J. E. Younglove.*—Bottle of blind fish, (*Amblyopsis*,) taken in a well in Bowling Green, Kentucky.

*Unknown.*—Box iron ores, St. Louis, Missouri.

*Hesperomys cognatus*, in alcohol.

Hammerhead shark from Norfolk.

Living raccoon and great horned owl.

# LIST OF METEOROLOGICAL STATIONS AND OBSERVERS

FOR THE YEAR 1857.

## BRITISH AMERICA.

| Name of observer. | Station. | N. lat. | W. long | Height |
|---|---|---|---|---|
| | | ° | ° ′ | *Feet.* |
| Baker, J. C | Stanbridge, Canada East | 45 08 | 73 00 | |
| Craigie, Dr. W | Hamilton, Canada West | 43 15 | 79 57 | |
| Delany, jr , John | Colonial Building, St. John's, Newfoundland. | 47 35 | 52 38 | |
| Gunn, Donald | Red river Settlement, Hudson's Bay Territory. | 50 06 | 97 00 | 853 |
| Hall, Dr. Archibald | Montreal, Canada East | 45 30 | 73 36 | 57 |
| Hensley, Rev. J. M | King's College, Windsor, Nova Scotia. | 44 59 | 64 07 | 200 |
| Magnetic Observatory | Toronto, Canada West | 43 39 | 79 21 | 108 |
| Smallwood, Dr. Charles | St. Martin, Isle Jesus, Canada East. | 45 32 | 73 36 | 118 |
| Steuart, A. P. S | Horton, Nova Scotia | 45 06 | 64 25 | 95 |

## MAINE.

| Name of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | *Feet.* |
| Bell, John J | Carmel | Penobscot | 44 47 | 69 00 | 175 |
| Dana, W. D | Perry | Washington | 45 00 | 67 06 | 100 |
| Gardiner, R. H | Gardiner | Kennebec | 44 11 | 69 46 | 90 |
| Guptill, G. W | Cornishville | York | 43 40 | 70 44 | 800 |
| Parker, J. D | Steuben | Washington | 44 44 | 67 58 | 50 |
| West, Silas | Cornish | York | 43 40 | 70 44 | 784 |
| Willis, Henry | Portland | Cumberland | 43 39 | 70 15 | 87 |
| Wilbur, Benj. F | Monson | Piscataquis | 43 11 | 69 35 | |

## NEW HAMPSHIRE.

| | | | | | |
|---|---|---|---|---|---|
| Bell, Samuel N | Manchester | Hillsborough | 42 59 | 71 28 | 300 |
| Bixby, A. H. | Francestown | Hillsborough | 42 59 | 71 45 | |
| Brown, B. Gould | Stratford | Coos | 44 08 | 71 34 | 1,000 |
| Freeman, F. N | Claremont | Sullivan | 43 29 | 72 22 | 535 |
| Hanscam, R. F | North Barnstead | Belknap | 43 38 | 71 27 | |
| Mack, R. C | Londonderry | Rockingham | 42 53 | 71 20 | |
| Odell, Fletcher | Shelburn | Coos | 44 23 | 71 06 | 700 |
| Prescott, Dr. Wm | Concord | Merrimack | 43 12 | 71 29 | 374 |
| Purmort, Nath | West Enfield | Grafton | 43 30 | 72 00 | |
| Root, Dr. Martin N | Francestown | Hillsborough | 43 00 | 71 46 | |
| Sawyer, Henry E. | Great Falls | Strafford | 43 17 | 70 52 | |
| | Concord | Merrimack | 43 12 | 71 20 | |

## PENNSYLVANIA.

| Name of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | Feet. |
| Brown, Samuel | Bedford | Bedford | 40 01 | 78 30 | |
| Baird, John H. | Tarentum | Alleghany | 40 37 | 79 19 | 950 |
| Brickenstein, H. A. | Nazareth | Northampton | 40 43 | 75 21 | |
| Brugger, Samuel | Fleming | Centre | 40 55 | 77 53 | 780 |
| Coffin, Selden, J. | Easton | Northampton | 40 43 | 75 16 | 320 |
| Comly, John | Byberry | Philadelphia | 40 06 | 74 58 | |
| Darlington, Fenelon | Pocopson | Chester | 39 54 | 75 37 | 218 |
| Edwards, Joseph | Chromedale | Delaware | 39 55 | 75 25 | 196 |
| Eggert, John | Berwick | Columbia | 41 05 | 76 15 | 588 |
| Friel, P. | Shamokin | Northumberland | 40 45 | 76 31 | 700 |
| Hance, Ebenezer | Morrisville | Bucks | 40 12 | 74 53 | 30 |
| Heisely, Dr. John | Harrisburg | Dauphin | 40 16 | 76 50 | |
| Hickok, W. O. | Harrisburg | Dauphin | 40 16 | 76 55 | |
| Hoffer, Mary E. | Mount Joy | Lancaster | 40 08 | 76 70 | |
| Jacobs, Rev M. | Gettysburg | Adams | 39 51 | 77 15 | |
| James, Prof. Charles S. | Lewisburg | Union | 40 58 | 76 58 | |
| Kirkpatrick, Prof. J. A. | Philadelphia | Philadelphia | 39 57 | 75 11 | 60 |
| Kohler, Edward | North Whitehall | Lehigh | 40 40 | 75 26 | 250 |
| Martin, William | Pittsburg | Alleghany | 40 30 | 80 00 | |
| Mowry, George | Somerset | Somerset | 40 02 | 79 02 | 2,180 |
| Ralston, Rev. J. Grier | Norristown | Montgomery | 40 08 | 75 19 | 153 |
| Schreiner, Francis | Moss Grove | Crawford | 41 40 | 79 51 | |
| Smith, Prof. Wm. | Canonsburg | Washington | 40 25 | 80 07 | 936 |
| Smyser, Rev. B. R. | Pottsville | Schuylkill | 40 41 | 76 09 | |
| Stewart, Thos. B. | Murrysville | Westmoreland | 40 28 | 79 35 | 960 |
| Swift, Dr. Paul | West Haverford | Delaware | 40 00 | 75 21 | |
| Thickstun, T. F. | Meadville | Crawford | 41 39 | 80 11 | 1,088 |
| Wilson, Prof. W. C. | Carlisle | Cumberland | 40 12 | 77 11 | 500 |
| Wilson, W. W. | Pittsburg | Alleghany | 40 32 | 80 02 | 1,026 |

## DELAWARE.

| | | | | | |
|---|---|---|---|---|---|
| Craven, Thos. J.<br>Porter, Mrs. E. D. | Newark | New Castle | 39 38 | 75 47 | 120 |
| Martin, R. A. | Milford | Kent | 39 55 | 75 27 | 25 |

## MARYLAND.

| | | | | | |
|---|---|---|---|---|---|
| Baer, Miss H. M. | Shellman Hills | Carroll | 39 23 | 76 57 | 700 |
| Cofrau, L. R. | Oakland | Alleghany | 39 40 | 79 00 | |
| Goodman, Wm. R. | Annapolis | Anne Arundel | 38 58 | 76 29 | 20 |
| Hanshew, Henry E. | Frederick | Frederick | 39 24 | 77 18 | |
| Lowndes, Benj. O. | Bladensburg | Prince George | 38 57 | 76 58 | |
| Mayer, Prof. Alfred | Baltimore | Baltimore | 39 18 | 76 37 | |
| Pearce, James A., jr. | Chestertown | Kent | 39 14 | 76 02 | |
| Stagg, T. G. | Ridge | St. Mary's | 38 05 | 76 18 | |

## DISTRICT OF COLUMBIA.

| | | | | | |
|---|---|---|---|---|---|
| Smithsonian Institution. | Washington | Washington | 38 53 | 77 01 | 30 |

## VIRGINIA.

| observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | *Feet.* |
| l. R. F. | Crichton's Store | Brunswick | 36 40 | 77 46 | 500 |
| nuel | Ashland | Putnam | 38 38 | 81 57 | |
| George C. | Rougemont | Albemarle | 38 05 | 78 21 | 450 |
| D. H | Crack Whip | Hardy | 39 30 | 78 31 | 1,750 |
| , H. H. | Montrose | Westmoreland | 38 07 | 76 54 | 200 |
| nes | Mustapha | Wood | 39 20 | 81 41 | |
| Benjamin | Alexandria | Alexandria | 38 48 | 77 01 | 56 |
| h W | Wirt C. H | Wirt | 39 05 | 81 26 | |
| Jed | Mossy Creek | Augusta | 38 20 | 79 05 | |
| Enoch D. | Sisterville | Tyler | 39 34 | 80 56 | 540 |
| ames E | Charleston | Jefferson | 38 20 | 81 21 | |
| Miss Ellen | Berryville | Clark | 39 09 | 78 00 | 575 |
| hn W | Winchester | Frederick | 39 15 | 78 10 | |
| ., M. D | Capon Bridge | Hampshire | 39 16 | 78 29 | |
| homas, M. D | Lewisburg | Greenbrier | 38 00 | 80 00 | 2,000 |
| hn R | Smithfield | Isle of Wight | 36 50 | 76 41 | 100 |
| ian C | Ruthven | Prince George | 37 21 | 77 33 | |
| avid L | Kanawha | Kanawha | 38 53 | 81 25 | |
| mes | Meadow Dale | Highland | 38 23 | 79 35 | |
| eorge W. | Rose Hill | Essex | 38 00 | 76 57 | 250 |
| Prof. N B | Portsmouth | Norfolk | 36 50 | 76 19 | 34 |
| Carson | Salem | Roanoke | 39 20 | 80 01 | 1,100 |
| Thomas J | Longwood | Rockbridge | 37 30 | 79 31 | 800 |

## NORTH CAROLINA.

| | | | | | |
|---|---|---|---|---|---|
| Dr. W. M. | Warrenton | Warren | 36 30 | 78 15 | |
| , Rev. A. | Murfreesboro' | Hertford | 36 30 | 77 06 | |
| , W. W | Asheville | Buncombe | 35 37 | 82 29 | 2,250 |
| o. F., M. D. | Gaston | Northampton | 36 32 | 77 45 | |
| Daniel | Goldsboro' | Wayne | 35 20 | 77 51 | |
| ev. Jas., D. D | Chapel Hill | Orange | 35 54 | 79 17 | |

## SOUTH CAROLINA.

| | | | | | |
|---|---|---|---|---|---|
| ohn H | Aiken | Barnwell | 33 32 | 81 34 | 565 |
| ohn L., M. D. | Charleston | Charleston | 32 46 | 80 00 | |
| N., M. D. | Edisto Island | Colleton | 32 34 | 80 18 | 23 |
| | Mount Pleasant | Laurens | 32 47 | 79 55 | |
| Rev. Alex'r | Waccaman | All Saints | 33 40 | 79 17 | 20 |
| Joseph, M. D | Charleston | Charleston | 32 46 | 80 00 | 30 |
| A., M. D. | Camden | Kershaw | 34 17 | 80 33 | 275 |

## GEORGIA.

| | | | | | |
|---|---|---|---|---|---|
| Jas , M. D | The Rock | Upson | 32 52 | 84 23 | 833 |
| Mrs. J. T. | Zebulon | Pike | 33 07 | 84 26 | |
| Prof. John D. | Athens | Clarke | 33 58 | 83 80 | 850 |
| . T. | Whitemarsh Is'd. | Savannah | 32 04 | 81 05 | 18 |

## GEORGIA—Continued.

| Name of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | Feet. |
| Glover, Eli S | Hillsboro' | Jasper | 33 13 | 83 45 | 566 |
| Haines, William | Augusta | Richmond | 33 20 | 81 54 | 1,470 |
| Pendleton, E. M., M. D. | Sparta | Hancock | 33 17 | 83 09 | 550 |
| Posey, John F | Savannah | Chatham | 32 05 | 81 07 | 42 |
| Reid, James M | Philomath | Oglethorpe | 33 45 | 83 15 | |
| Simpson, F. T | Factory Mills | Wilkes | 33 40 | 84 46 | |

## FLORIDA.

| | | | | | |
|---|---|---|---|---|---|
| Bailey, James B | Gainesville | Alachua | 29 35 | 82 26 | 184 |
| Baldwin, A. G., M. D. | Jacksonville | Duval | 30 30 | 82 00 | 13 |
| Batchelder, F. L | Hibernia | Duval | 30 15 | 81 30 | 15 |
| Dennis, Wm. C | Salt Ponds | Key West | 24 33 | 81 48 | |
| Fry, Joseph; Hester, Lieut. J. W., U. S. N | Pensacola | Escambia | 30 20 | 87 16 | 12 |
| Ives, Edward R | Alligator | Columbia | 30 12 | 82 37 | 174 |
| Mauran, P. B., M. D. | St. Augustine | St. John's | 29 48 | 81 35 | 8 |
| Steele, Judge Aug | Cedar Keys | Levy | 29 07 | 83 02 | 12 |
| Whitner, Benj. F | Belair | Leon | 30 24 | 84 20 | 70 |

## ALABAMA.

| | | | | | |
|---|---|---|---|---|---|
| Alison, H. L, M. D | Carlowville | Dallas | 32 10 | 87 15 | 300 |
| Barker, Thomas M | Ashville | St. Clair | 33 52 | 86 20 | |
| Darby, Prof. John | Auburn | Macon | 32 37 | 85 34 | 821 |
| Tutwiler, Henry | Greene Springs | Greene | 32 50 | 87 46 | |
| Waller, Robert B. | Greensboro' | Greene | 32 40 | 87 34 | 350 |

## MISSISSIPPI.

| | | | | | |
|---|---|---|---|---|---|
| Elliott, Prof. J. Boyd | Port Gibson | Claiborne | 31 50 | 91 01 | 100 |
| Lull, James S | Columbus | Lowndes | 33 30 | 88 29 | 227 |

## LOUISIANA.

| | | | | | |
|---|---|---|---|---|---|
| Barton, Dr. E. H. | New Orleans | Orleans | 29 57 | 90 00 | |
| Kilpatrick, A. R., M. D. | Trinity | Chatahoula | 31 30 | 91 46 | 108 |
| Merrill, Edward, M. D. | Trinity | Chatahoula | 31 37 | 91 47 | 68 |
| Taylor, Lewes B. | New Orleans | Orleans | 29 57 | 90 00 | |

## TEXAS.

| of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | Feet. |
| ı, John C. | Goliad | Goliad | 28 30 | 97 15 | 50 |
| | Helena | Karnes | 29 00 | 97 56 | 600 |
| L. | New Wied | Comal | 29 42 | 98 15 | |
| k, Otto | New Braumfels | Comal | 29 41 | 98 15 | |
| Wm. H. | Union Hill | Washington | 30 30 | 96 31 | 540 |
| S. K., M.D. strand, J. | Austin | Travis | 30 20 | 97 46 | 650 |
| . H. | Washington | Washington | 30 26 | 96 15 | |

## TENNESSEE.

| | | | | | |
|---|---|---|---|---|---|
| es B. | Walnut Grove | Greene | 36 00 | 82 53 | 1,350 |
| rof. Wm. M. | Glenwood | Montgomery | 36 28 | 87 13 | 481 |
| J., M. D. | Memphis | Shelby | 35 08 | 90 00 | 262 |
| r. Dan'l F. | Memphis | Shelby | 35 08 | 90 00 | 262 |

## KENTUCKY.

| | | | | | |
|---|---|---|---|---|---|
| | Danville | Boyle | 37 40 | 84 30 | 950 |
| ., M. D. | Paris | Bourbon | 38 16 | 84 07 | 810 |
| ev. Geo. S. | Millersburg | Bourbon | 38 20 | 84 20 | 804 |
| rs. Lawrence | Springdale | Jefferson | 38 07 | 85 34 | 570 |

## OHIO.

| | | | | | |
|---|---|---|---|---|---|
| F. | Welchfield | Geauga | 41 23 | 81 12 | 1,115 |
| of. Geo. N. | Oberlin | Loraine | 41 20 | 82 15 | 800 |
| I. | Ripley | Brown | 38 47 | 83 31 | |
| Newton | Mount Union | Stark | 41 20 | 81 01 | |
| ev. L. S. | Madison | Lake | 41 49 | 81 10 | |
| . F. | New Lisbon | Columbiana | 40 45 | 80 46 | |
| Henry | Collingwood | Lucas | 41 49 | 83 34 | |
| I. S. | Germantown | Montgomery | 39 39 | 84 11 | |
| Prof. R. S. | College Hill | Hamilton | 39 19 | 84 25 | 800 |
| am, Miss A. | Unionville | Lake | 41 52 | 81 00 | 650 |
| ewis M. | Lancaster | Fairfield | 39 40 | 82 40 | |
| oses | Jackson | Jackson | 39 10 | 82 32 | 666 |
| l, Ebenezer | Cheviot | Hamilton | 39 07 | 84 34 | |
| eorge W. | Cincinnati | Hamilton | 39 06 | 84 27 | 150 |
| ames D. | Jefferson | Ashtabula | 42 00 | 81 00 | |
| k, F. & D. K. | Perrysburg | Wood | 41 39 | 83 40 | |
| . G. F., M. D. | Zanesville | Muskingum | 39 58 | 82 01 | 700 |
| ncis W. | Cincinnati | Hamilton | 39 06 | 84 34 | |
| stavus A. | Cleveland | Cuyahoga | 41 30 | 81 40 | 665 |
| ohn, M. D. | Savannah | Ashland | 41 12 | 82 31 | |
| C. | Hillsborough | Highland. | | | |
| M. | Hiram | Portage | 41 20 | 81 15 | 675 |

## OHIO—Continued.

| Name of observer. | Station. | County. | N. lat. | W. long | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | Feet. |
| Mathews, Joseph McD. | Hillsborough | Highland | 39 13 | 83 30 | 1,000 |
| McCarty, H. D. | West Bedford | Coshocton | 40 18 | 82 01 | 876 |
| Peck, W. R., M. D. | Bowling Green | Wood | 41 27 | 83 45 | 700 |
| Poe, James H. | Portsmouth | Scioto | 38 50 | 82 49 | 468 |
| Roger, A. P. | Gallipolis | Gallia | 39 00 | 82 01 | 520 |
| Sanford, Prof. S. N. | Granville | Licking | 40 03 | 82 34 | 995 |
| Sanford, Smith | Edinburg | Portage | 41 20 | 81 00 | 520 |
| Schenck, W. L, M. D. | Franklin | Warren | 39 30 | 84 10 | |
| Shaw, Joseph | Bellefontaine | Logan | 40 21 | 83 40 | 1,031 |
| Shaw, Joseph | Sidney | Shelby | 40 21 | 84 11 | |
| Shields, Robert<br>Smith, John C. | Bellecentre | Logan | 40 28 | 83 45 | 1,170 |
| Treat, Samuel W. | Windham | Portage | 41 10 | 81 05 | |
| Ward, L. F. | Medina | Medina | 41 07 | 81 47 | 1,206 |
| Williams, Prof. M. G. | Urbana | Champaign | 40 06 | 83 43 | 1,015 |

## MICHIGAN.

| | | | | | |
|---|---|---|---|---|---|
| Allen, James | Port Huron | St. Clair | 42 53 | 82 24 | 606 |
| Andrews, Seth L., M.D. | Romeo | Macomb | 42 44 | 83 00 | 730 |
| Campbell, Wm. M., M.D. | Battle Creek | Calhoun | 42 20 | 85 10 | 750 |
| Crosby, J. B. | New Buffalo | Berrien | 41 45 | 86 46 | 600 |
| Currier, Alfred O. | Grand Rapids | Kent | 43 00 | 86 00 | 752 |
| Streng, L. H. | Grand Rapids | Kent | 43 00 | 86 00 | 852 |
| Walker, Mrs. Octavia C. | Cooper | Kalamazoo | 42 40 | 85 31 | |
| Whelpley, Miss H | Monroe | Monroe | 41 56 | 83 22 | 590 |
| White, Peter | Marquette | Marquette | 46 32 | 87 41 | 630 |
| Whittlesey, Chas. S. | Copper Falls | Houghton | 47 25 | 88 16 | 1,230 |
| Winchell, Prof. A | Ann Arbor | Washtenaw | 42 16 | 83 44 | 891 |
| Woodruff, Lum | Ann Arbor | Washtenaw | 42 16 | 83 30 | 850 |

## INDIANA.

| | | | | | |
|---|---|---|---|---|---|
| Barnes, C. | New Albany | Floyd | 38 17 | 85 45 | |
| Chappellsmith, John | New Harmony | Posey | 38 08 | 87 50 | 320 |
| Crisp, John F. | Evansville | Vanderburgh | 38 08 | 87 29 | 390 |
| Lasselle, Charles B. | Logansport | Cass | 40 45 | 86 13 | 600 |
| Moore, Joseph | Richmond | Wayne | 39 47 | 84 47 | 800 |
| Smith, Hamilton | Cannelton | Perry | 37 58 | 86 40 | 450 |
| Woodard, C. S | Michigan City | La Porte | 41 41 | 86 53 | 622 |

## ILLINOIS.

| | | | | | |
|---|---|---|---|---|---|
| Babcock, Andrew J. | Aurora | Kane | 41 40 | 88 15 | 600 |
| Babcock, E. | Riley | McHenry | 42 08 | 88 33 | 650 |
| Baker, Frank | South Pass | Union | 37 28 | 89 14 | |
| Bowman, Dr. E. H. | Edgington | Rock Island | 41 25 | 90 46 | |
| Brendel, Fred'k, M.D. | Peoria | Peoria | 40 36 | 89 30 | |
| Eldredge, William V. | Brighton | Macoupin | 39 00 | 90 13 | |

## ILLINOIS—Continued.

| of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | *Feet.* |
| John | Manchester | Scott | 39 33 | 90 34 | 683 |
| el | Athens | Menard | 39 52 | 89 56 | |
| J. O., M. D. | Ottawa | La Salle | 41 20 | 88 47 | 500 |
| G. D. | Chicago | Cook | 41 53 | 87 41 | 600 |
| Anna | Upper Alton | Madison | 39 00 | 89 36 | |
| , J. L. | Granville | Putnam | 41 14 | 89 21 | |
| S. B., M. D. | Augusta | Hancock | 40 12 | 89 45 | 200 |
| Thompson | Batavia | Kane | 41 52 | 88 20 | 636 |
| J. H. | Pekin | Tazewell | 40 36 | 89 45 | |
| O. P. | Marengo | McHenry | 42 14 | 88 38 | 650 |
| Isaac H. | Fremont Centre | Lake | 42 18 | 88 06 | 736 |
| John, M. D. | West Urbana | Champaign | 40 09 | 88 17 | 550 |
| Henry A. | West Salem | Edwards | 38 30 | 88 00 | |
| e, Samuel Jacob. | Carthage | Hancock | 40 23 | 90 17 | |
| er, Benjamin | Warsaw | Hancock | 40 20 | 91 31 | |

## MISSOURI.

| | | | | | |
|---|---|---|---|---|---|
| nus, A., M. D. | St. Louis | St. Louis | 38 37 | 90 16 | 461 |

## IOWA.

| | | | | | |
|---|---|---|---|---|---|
| Dexter<br>, Willard W. | Franklin | Buchanan | 42 45 | 87 16 | |
| n, Carlisle D. | Rossville | Allamakee | 43 10 | 91 21 | 1,400 |
| John C. | Bellevue | Jackson | 42 15 | 90 25 | |
| William K. | Border Plains | Webster | 42 36 | 94 05 | |
| t, Edward F. | Maquoketa | Jackson | 42 04 | 90 41 | |
| Asa, M. D. | Dubuque | Dubuque | 42 30 | 90 52 | 1,258 |
| nell, Townsend. | Pleasant Plain | Jefferson | 41 07 | 91 54 | |
| ady, Daniel | Fort Madison | Lee | 40 37 | 91 28 | |
| r, Nathan H. | Clinton | Clinton | 41 48 | 90 15 | |
| , T. S. | Muscatine | Muscatine | 41 26 | 91 05 | 586 |
| lds, W. | Iowa City | Johnson | 41 39 | 91 33 | |
| e, Dr. J. J. | Sioux City | Woodbury | 42 31 | 96 25 | |
| r, J. M., M. D. | Fairfield | Jefferson | 41 01 | 91 57 | 940 |
| , Prof, B. Wilson | Mount Vernon | Linn | 42 00 | 91 00 | |

## WISCONSIN.

| | | | | | |
|---|---|---|---|---|---|
| Prof. S. A.<br>, L. C., M. D. | Waukesha | Waukesha | 42 50 | 88 11 | 833 |
| J. Everett | New London | Waupacca | 44 21 | 88 45 | |
| ler, Marine T. W. | Falls of St. Croix | Polk | 45 30 | 92 40 | 660 |
| m, W. J. | Racine | Racine | 42 49 | 87 40 | |
| Edwin | Bay City | La Pointe | 46 33 | 91 00 | 658 |
| y, Rev. John | Kenosha | Kenosha | 42 35 | 87 50 | 600 |
| r, Spencer L. | Prescott | Pierce | 44 56 | 92 40 | 800 |
| e, John E. | Norway | Racine | 42 50 | 88 10 | 753 |

## WISCONSIN—Continued.

| Name of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | Feet. |
| Lapham, Increase A. | Milwaukie | Milwaukie. | 43 03 | 87 57 | 593 |
| Lüps, Jacob | Manitowoc | Manitowoc | 44 07 | 87 37 | |
| Mason, Prof. R. Z. | Appleton | Outagamie | 44 10 | 88 35 | 800 |
| Pickard, J. L., M. D. | Platteville | Grant | 42 45 | 91 00 | |
| Pomeroy, F. C. | Milwaukie | Milwaukie | 43 04 | 87 59 | 658 |
| Porter, Prof Wm. | Beloit | Rock | 42 30 | 89 04 | 750 |
| Schue, A., M. D. | Madison | Dane | 43 05 | 89 25 | 892 |
| Sterling, Prof. J. W. | Madison | Dane | 43 05 | 89 25 | 892 |
| Struthers, R. H. | Lind | Waupacca | 44 20 | 89 00 | |
| Underwood, Col. D. | Menasha | Winnebago | 44 13 | 88 18 | |
| Winkler, C., M. D. | Milwaukie | Milwaukie | 43 04 | 87 57 | 593 |
| Willard, J. F. | Janesville | Rock | 42 42 | 89 91 | 768 |

## MINNESOTA.

| | | | | | |
|---|---|---|---|---|---|
| Garrison, O. E. | Princeton | Benton | 45 50 | 93 45 | |
| Hillier, Spencer L. | Wabashaw | Wabashaw | 44 30 | 92 15 | 850 |
| Odell, Rev. Benj. F. | Lake Winnibigoshish. | | 47 30 | 94 40 | |
| Riggs, S. R. | Hazlewood | | 45 | 95 30 | |
| Walsh, Stephen | Buchanan | | 47 33 | 92 00 | |
| Wright, E. M. | Lapham | Pembina | 46 10 | 96 00 | 850 |

## NEBRASKA.

| | | | | | |
|---|---|---|---|---|---|
| Byers, Wm. N. | Omaha | Douglas | 41 15 | 96 10 | |
| Hamilton, William | Bellevue | Sarpy | 41 08 | 95 50 | |

## KANSAS.

| | | | | | |
|---|---|---|---|---|---|
| Brown, G. W. | Lawrence | Douglas | 38 58 | 95 12 | 800 |
| Fish, Edmund | Council City | Shawnee | 38 42 | 95 50 | |
| Goodnow, Isaac T. | Manhattan | Riley | 39 13 | 96 45 | |
| Himoe, S O., M. D. | Mapleton | Bourbon | 38 04 | 94 51 | |
| McCarty, H. D. | Leavenworth City | Leavenworth | 39 20 | 94 33 | 1,342 |

## UTAH.

| | | | | | |
|---|---|---|---|---|---|
| Phelps, Henry E. | Great Salt Lake City. | | 40 45 | 111 26 | 4,250 |

## CALIFORNIA.

| of observer. | Station. | County. | N. lat. | W. long. | Height. |
|---|---|---|---|---|---|
| | | | ° ′ | ° ′ | *Feet.* |
| /. O., M. D. | San Francisco | San Francisco | 37 48 | 122 23 | 115 |
| W. C. | Marysville | Yuba | 39 12 | 121 42 | |
| Thos. M., M.D. | Sacramento | Sacramento | 38 35 | 121 40 | 49 |

## GUATEMALA.

CANUDUS, ANTONIO COLLEGE.

## SOUTH AMERICA.

| : of Observer. | Station. | Lat. | Lon. | Height. |
|---|---|---|---|---|
| | | ° ′ | ° ′ | *Feet.* |
| , A. | Colonia Tovar, Venezuela | 10 26 | 67 20 | 6,500 |
| al Surveyors | Port of Spain, Trinidad | 10 39 | 61 34 | 16 |
| C. J. | Plantation, Catharina Sophia, Colony of Surinam, Dutch Guiana | 5 48 | 56 47 | |
| ea, Dr. E. | Bogota, New Granada | 4 36 | 74 14 | 8,863 |

## BERMUDA.

| | | | | |
|---|---|---|---|---|
| James B. | Shelby Bay | 32 28 | 64 32 | |
| uette | | | | |

## AZORES.

| | | | | |
|---|---|---|---|---|
| S. W. | Honta, Fayal Island | 38 30 | 28 42 | 80 |

# REPORT OF THE EXECUTIVE COMMITTEE.

The Executive Committee respectfully submit to the Board of Regents the following report of the receipts and expenditures of the Smithsonian Institution during the year 1857, with estimates for the year 1858:

RECEIPTS.

| | | |
|---|---|---|
| The whole amount of Smithson's bequest deposited in the treasury of the United States is $515,169, from which an annual income, at 6 per cent., is derived, of | | $30,910 14 |
| Extra fund from unexpended income invested as follows: | | |
| In $75,000 Indiana 5 per cent. bonds, yielding | $3,750 00 | |
| In $53,000 Virginia 6 per cent. bonds, yielding | 3,210 00 | |
| In $7,000 Tennessee 6 per cent. bonds, yielding | 420 00 | |
| In $500 Georgia 6 per cent. bonds, yielding | 30 00 | |
| In $100 Washington 6 per cent. bonds, yielding | 6 00 | |
| | | 7,416 00 |
| | | 38,326 14 |
| Balance in hands of Treasurer January 1, 1857 | | 7,164 32 |
| Total receipts | | $45,490 46 |

GENERAL STATEMENT OF EXPENDITURES.

| | | |
|---|---|---|
| For building, furniture, and fixtures | $4,062 65 | |
| For items common to the different objects of the Institution | 13,035 18 | |
| For publications, researches, and lectures. | 11,051 52 | |
| For library, museum, and gallery of art.. | 6,999 81 | |
| | | $35,149 16 |
| Balance in the hands of the Treasurer January 1, 1858, of which $5,000 belongs to the extra fund. | | 10,341 30 |

tement in detail of the expenditures during 1857:

BUILDING, FURNITURE, FIXTURES, ETC.

| | | |
|---|---|---|
| irs, &c., incident to building | $3,305 12 | |
| iture and fixtures for uses in common. | 373 61 | |
| iture and fixtures for library | 163 50 | |
| iture and fixtures for museum | 150 80 | |
| ıetic observatory | 49 62 | |
| nds | 20 00 | |
| | | $4,062 65 |

GENERAL EXPENSES.

| | | |
|---|---|---|
| ings of Board and Committees | $281 00 | |
| ting and heating | 1,244 33 | |
| ıge | 524 02 | |
| ısportation and exchange | 2,264 74 | |
| ionery | 347 94 | |
| ɜral printing | 236 50 | |
| aratus | 191 66 | |
| ɔratory | 341 38 | |
| ry of the Secretary | 3,499 92 | |
| Chief clerk | 1,200 00 | |
| Book-keeper | 200 00 | |
| Janitor | 400 97 | |
| Watchmen | 534 65 | |
| Laborers | 794 00 | |
| Messenger | 128 00 | |
| ra clerk hire | 222 00 | |
| dentals, general | 624 07 | |
| | | 13,035 18 |

PUBLICATIONS, RESEARCHES, AND LECTURES.

| | | |
|---|---|---|
| thsonian Contributions | $6,230 02 | |
| orts on progress of knowledge | 342 00 | |
| ɜr publications | 649 90 | |
| ɜorology | 2,465 24 | |
| ıstigations, computations, and re-arches | 250 00 | |
| of lecturers | 980 00 | |
| dentals to lectures | 134 36 | |
| | | 11,051 52 |

LIBRARY, MUSEUM, AND GALLERY OF ART.

| | | |
|---|---|---|
| of books | $2,019 83 | |
| of assistants | 1,194 12 | |
| ısportation for library | 200 00 | |
| eum—salary | 1,999 92 | |

| | | |
|---|---|---|
| Explorations | $57 52 | |
| Collections | 49 78 | |
| Alcohol, jars, and museum incidentals | 445 77 | |
| Transportation for museum | 450 00 | |
| Assistance and labor in museum | 500 00 | |
| Gallery of art | 82 87 | |
| | | $6,999 81 |
| Total expenditure | | $35,149 16 |

The estimated income for the year 1857 was $38,290 14, exclusive of the balance in the hands of the Treasurer; the *actual* income exclusive of this balance was $38,326 14.

The estimated expenditure amounted to $34,000, the actual expenditure to $35,149 16. The excess is due to unexpected repairs, necessary to the building in consequence of a very severe hail storm, which broke several thousand panes of glass, and otherwise injured the edifice; and to the payment of the last unsettled account contracted by the architect for the gas pipes and fixtures.

The expenditures, however, are less than the income for the year, leaving a total balance now in the hands of the Treasurer of $10,341 30. Of this sum, $5,000 are the remainder of the extra fund, ($125,000,) intended to be permanently invested, and the whole is at present required for carrying on the operations of the Institution, until the receipt of the next semi-annual income.

During the past year, the stocks purchased by the Institution temporarily declined in commercial value, but they are now selling at about the same prices as those at which they were bought. Fluctuations, however, of this character do not affect the income of the Institution, since the amount of interest continues permanently the same.

The committee respectfully submit the following estimate of the receipts and expenditures for the year 1858:

*Receipts.*

| | |
|---|---|
| Balance in the hands of the Treasurer January 1, 1858, (exclusive of $5,000 belonging to the extra fund) | $5,341 30 |
| Interest on the original fund for 1858 | 30,910 14 |
| Interest on the extra fund invested in State stocks | 7,416 00 |
| | $43,667 44 |

*Expenditures.*

BUILDING, FURNITURE AND FIXTURES, ETC.

| | | |
|---|---|---|
| Repairs and incidentals | $1,500 00 | |
| Furniture and fixtures in common | 500 00 | |
| " " for library | 150 00 | |
| " " for museum | 150 00 | |
| Magnetic observatory | 50 00 | |
| | | $2,350 00 |

GENERAL EXPENSES.

| | | |
|---|---|---|
| tings of Board and committees | $300 00 | |
| ıting and heating | 600 00 | |
| age | 500 00 | |
| ısportation and exchange | 2,500 00 | |
| ionery | 350 00 | |
| eral printing | 350 00 | |
| aratus | 250 00 | |
| ɔratory | 400 00 | |
| lentals, general | 650 00 | |
| ries.—Secretary | 3,500 00 | |
| Chief clerk | 1,400 00 | |
| Book-keeper | 200 00 | |
| Janitor | 400 00 | |
| Watchman | 500 00 | |
| Laborers | 800 00 | |
| Extra clerk hire | 300 00 | |
| | | $13,000 00 |

PUBLICATIONS, RESEARCHES AND LECTURES.

| | | |
|---|---|---|
| ;hsonian Contributions to Knowledge | $6,500 00 | |
| ɔrts | 1,500 00 | |
| ɜr publications | 1,000 00 | |
| ɜorology | 3,000 00 | |
| stigations, computations, and researches | 250 00 | |
| ures | 1,000 00 | |
| | | 13,250 00 |

LIBRARY, MUSEUM AND GALLERY OF ART.

| | | |
|---|---|---|
| of books | $3,000 00 | |
| of assistants in library | 1,200 00 | |
| ısportation for library | 400 00 | |
| lentals for library | 150 00 | |
| ɜum—salary | 2,000 00 | |
| lorations | 50 00 | |
| ɜctions | 50 00 | |
| lentals, museum, jars, alcohol, &c | 300 00 | |
| ısportation, museum | 550 00 | |
| stants and labor, museum | 600 00 | |
| ery of art | 100 00 | |
| | | 8,400 00 |
| | | $37,000 00 |

is impossible to make a very definite estimate of the expendi-
ı on account of the museum, during the year 1858, because the

collection at the Patent Office is to be transferred to the keeping of the Institution, and the amount of expenditures under this head will depend upon the appropriation made by Congress for this purpose.

In conclusion, the committee report that they have examined the books, and each account for the past year, separately, and find them all correct.

Respectfully submitted.

J. A. PEARCE,
A. D. BACHE,
JOS. G. TOTTEN,
*Executive Committee.*

# REPORT OF THE BUILDING COMMITTEE.

'he building of the Smithsonian Institution having been completed, special object of the Building Committee for which it was originally ›ointed, might be considered accomplished, and therefore an annual ort no longer necessary; but as a large portion of the edifice re-ined unfinished, and since repairs are required which will probably very expensive, it is thought proper that the committee should be tinued.

ıt the last session of Congress an appropriation of fifteen thousand lars was made for cases for the accommodation of the collections ›nging to government. These are now finished and form a beauti-addition to the large hall, and are apparently well adapted to the pose for which they are intended. With strict economy the appro-ıtion of Congress has been found sufficient to provide accommoda-ıs for the present reception of the articles, though in the course of e additional cases will be required.

'he west wing of the building, devoted to the library, has been ıished with alcoves and a gallery extending around three sides of large room. This arrangement, which will serve very much to :ease the accommodation and security of the books, produces a y pleasing architectural effect.

'he large cisterns in the grounds near the building, which were ›cted to be arched over at the last session of the Board, have been perly secured, and one of them converted into an ice-house.

'he balance of a bill for gas fixtures, which had been contracted by architect, and which remained unsettled, on account of a disagree-nt as to certain charges, has been finally paid, after a reduction of ›2 99.

The peculiar style of architecture of the building, and the large ount of surface it exposes to the weather, renders constant repairs ›essary. During the past year almost the whole time of two work-n has been occupied in this service.

Respectfully submitted.

RICHARD RUSH,
WM. H. ENGLISH,
JOSEPH HENRY,
*Building Committee.*

# JOURNAL OF PROCEEDINGS

OF THE

# BOARD OF REGENTS

OF

# THE SMITHSONIAN INSTITUTION.

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## MONDAY, MARCH 16, 1857.

A meeting of the Board of Regents was held this day at 11 o'clock a. m.

Present: Hon. R. B. Taney, Chancellor, Hon. John C. Breckinridge, James M. Mason, S. A. Douglas, Gen. Jos. G. Totten, Prof. A. D. Bache, Wm. B. Magruder, and the Secretary.

The minutes of the last meeting were read and approved.

The Chancellor, Chief Justice Taney, then presented the following communication:

WASHINGTON, *March* 16, 1857.

GENTLEMEN: When the Board of Regents was originally organized it was deemed proper that the Vice President of the United States for the time being should be elected as the Chancellor. The Institution exists under the authority of Congress, and they have made certain officers of the government *ex officio* Regents. The Vice President is the highest in rank of the officers thus designated; and it would seem to be peculiarly proper that the one who presides over the deliberations of one branch of the national legislature should also preside over the deliberations of a scientific institution which the nation has brought into existence and fosters.

Unfortunate events have for some time past left the government without a Vice President elected by the people. And when that office was vacant the Regents conferred on me the office which had always before been filled by the Vice President. And when I accepted it I regarded the appointment as a temporary one. The reason for the appointment has now happily ceased, and I desire to give the Regents

an opportunity of restoring the original plan of organization, in which I fully concurred when it was adopted.

I therefore resign the office of Chancellor of the Institution, and at the same time return my thanks for the honor which the Regents bestowed upon me in electing me to that office.

But my resignation will not lessen the interest I feel in the Institution. On the contrary, every year's experience has more and more convinced me of its usefulness and efficiency in promoting the objects of its founder, and I shall always be ready to offer my humble aid if I can be useful in advancing its prosperity and success.

I have the honor to be, with the highest respect, your obedient servant,

R. B. TANEY.

To the REGENTS OF THE SMITHSONIAN INSTITUTION.

Mr. Breckinridge, Vice President of the United States, moved that the present Chancellor, Chief Justice Taney, be re-elected to that office, expressing his unwillingness to assume the position which had been so long and so ably filled by its present occupant.

The motion was adopted unanimously, whereupon Judge Taney remarked that he was anxious to serve the Institution to the best of his ability, and he could not decline this expression of the confidence of the Board if they insisted on his retaining the office of Chancellor.

The Secretary announced that, by joint resolution of the Senate and House of Representatives, Hon. Richard Rush, of Pennsylvania, and Gen. Joseph G. Totten, of the city of Washington, had been re-elected Regents for six years; also that the President of the Senate had re-appointed Hon. James A. Pearce and Hon. James M. Mason, Regents for the same period of time.

The Secretary announced to the Board that, since its last meeting, three distinguished men of science, correspondents of the Institution, had deceased, namely: Prof. J. W. BAILEY, Dr. E. K. KANE, and Mr. W. C. REDFIELD.

On this announcement Prof. Bache offered a series of appropriate remarks, referring to their eminent services in the promotion of science.

Gen. Totten offered the following resolutions, which were adopted:

*Resolved*, That the Regents of the Smithsonian Institution have heard with regret the announcement of the death of Prof. JACOB W. BAILEY, whose communications to the Smithsonian Contributions have

attracted the notice and won the approval of naturalists throughout the world.

*Resolved*, That the Regents offer to the family of Prof. Bailey their condolence on the loss which they have sustained.

Mr. Douglas offered the following resolutions, which were adopted:

*Resolved*, That the Regents of the Smithsonian Institution, in common with the whole country, have heard with deep regret of the death of one of their esteemed collaborators, Dr. E. K. KANE, to whom was committed by this Institution a set of philosophical instruments for the purpose of research in the polar regions, which he used, and carefully returned at the hazard of his life, with a series of observations of great value to science.

*Resolved*, That the Regents offer to the family of Dr. Kane their condolence on the loss which they have sustained.

Prof. Bache offered the following resolution, which was adopted:

*Resolved*, That the Regents of the Smithsonian Institution have heard with regret of the decease of their valued correspondent, WILLIAM C. REDFIELD, of New York, whose labors in meteorology have rendered his name familiar to men of science in every part of the civilized world, and offer to his family their condolence on the loss which they have sustained.

A communication from Dr. Robert Hare was read, relative to the practical construction of minute weights and measures.

On motion of Dr. Magruder, the following resolutions were adopted:

*Resolved*, That a copy of the communication of Dr. Hare be transmitted to the Secretary of the Treasury, with the recommendation of the Board of Regents that the instrument offered by Dr. Hare be received by the government, and placed in the Office of Weights and Measures.

*Resolved*, That the communication of Dr. Hare be inserted in the appendix to the report of the Regents to Congress.

A communication from J. A. Johnson, esq., of Maryland, relative to an "International Geographic and Scientific Commission" was read and referred to the Executive Committee and the Secretary.

The Secretary made a communication to the Board, relative to an article which had been published by Prof. S. F. B. Morse, containing charges against his moral character and his scientific reputation.

The Chancellor made a few remarks, confirming Prof. Henry's statement as to the advice he had given him respecting this attack.

On motion of Mr. Mason, the following resolution was adopted:

*Resolved*, That the communication of the Secretary and accompany-

ing documents be referred to a committee, to examine and report upon it at the next session of the Board of Regents.

Whereupon the Chancellor appointed Messrs. Mason, Pearce, Felton, and Douglas as the committee.

The Board then adjourned *sine die*.

---

WASHINGTON, *January* 20, 1858.

In accordance with a resolution of the Board of Regents of the Smithsonian Institution, fixing the time of the beginning of their annual meeting on the third Wednesday of January of each year, the Board met this day in the Regents' room.

No quorum being present, the Board adjourned to meet on Thursday, January 28, 1858.

THURSDAY, JANUARY 28, 1858.

A meeting of the Board of Regents was held this day at 10 a. m., in the Smithsonian Institution.

Present: Hon. John C. Breckinridge, Vice President of the United States, Hon. J. M. Mason, Hon. S. A. Douglas, Hon. George E. Badger, Prof. A. D. Bache, Prof. C. C. Felton, Mr. Seaton, Treasurer, and the Secretary.

In the absence of the Chancellor the Vice President was called to the chair.

The minutes of the last meeting were read and approved.

The Secretary stated that, since the last meeting of the Board, the Speaker of the House of Representatives had appointed Hon. William H. English, of Indiana, Hon. Benjamin Stanton, of Ohio, and Hon. L. J. Gartrell, of Georgia, as Regents for the term of their service as members of the House.

The Treasurer presented a statement of the receipts and expenditures during the year 1857, and also a general statement of the funds; which were referred to the Executive Committee.

The following communication was presented:

WASHINGTON, *January* 23, 1858.

GENTLEMEN: The undersigned offers for sale, and respectfully suggests to your honorable Board the propriety of purchasing, the *gallery* of *Indian portraits* now, and for some years past, in the Smithsonian Institution.

He proposes to sell the whole collection described in the catalogue published by the Institution, one hundred and fifty-two in number, for the sum of twelve thousand dollars—one-third of the same cash and the remainder at two equal annual instalments; or, if it should be preferred, one-fourth down and the residue in three equal annual instalments.

The undersigned commenced his labors in this work in 1842, and devoted the best years of his life in travelling through the region of our country peopled principally by the red man—through the wilds of Oregon and what is now Washington Territory. All of the portraits are accurate likenesses of prominent chiefs and braves, and readily recognized by men who have had intercourse with the various tribes of Indians.

Since 1852 he has cherished the hope (but has not been able to realize it) that Congress would authorize the purchase of this collection. He has, up to this time, made sacrifices—such as one believing in the merit of his own work, and whose zeal in persevering through arduous and unremitting toil to accomplish it, alone would make—to keep this collection together. He will not affect the modesty of refraining from expressing his belief that no other gallery (aside from what artistic merit the public may award it) possesses the interest, in a national point of view, that this does. Some of the chiefs represented are no longer living; and, to the little we know of their history it will be some satisfaction to add the perpetuation of their features. These were taken from life and in the character they themselves preferred to be handed down to the gaze of future generations.

The price at which he offers this collection will not more than cover the outlay in cost of material, transportation, insurance, travelling expenses, &c., and will not afford him any compensation for his time and labor. Taking, as he humbly conceives, the intrinsic value of these Indian portraits into consideration, he will receive no pecuniary profit by their disposal on the terms named.

His ardent desire that they should be preserved, as a national work, in some place at the capital of our country; his failure heretofore to induce Congress to agree to their purchase, and the more pressing reasons of *liabilities* now maturing, impel him to make this proposition. Your honorable Board are again requested to consider it and communicate your answer at as early a day as is convenient. If the purchase of the portraits is not authorized by you, he will be com-

pelled to expose them at public auction in time to have the proceeds available by the 1st of May next.

The undersigned will take this occasion to tender his acknowledgments to the Board and Professor Henry for the use of the hall in the Institution where the gallery now is, and for other courtesies, which he will always appreciate.

I am, very respectfully, your obedient servant,

J. M. STANLEY.

The Hon. BOARD OF REGENTS *of the Smithsonian Institution.*

On motion, this communication was referred to a special committee, and Messrs. Felton, Douglas, and Badger were appointed.

The Secretary laid before the Board a present from Miss Contaxaki, of Greece, consisting of a volume of drawings, &c., illustrating the celebrated works of art in her own land, together with the following letters:

WASHINGTON, *November* 23, 1857.

SIR: During my last trip to the east I was charged by Miss Elizabeth B. Contaxaki, a native of the isle of Crete, with an "ornamental album," which she desired me to present, through you, to the Smithsonian Institution. In forming the work, this lady designed it as a contribution to the Universal Exhibition at Paris, in 1855, worthy of the classic renown of the ancient city of Athens. So ardent is her admiration of the United States and its institutions that she wishes it to be permanently placed in this country, and having a high appreciation of you as an American statesman, and your reputation as a classical scholar, she desired that I would request you to offer it in her name to the Smithsonian Institution.

The "Classical Bouquet," as it is entitled, consists of illustrations of the principal monuments and places in the kingdom of Greece, to which are added a few from her native isle of Crete, not yet emancipated from the Moslem yoke. These illustrations are explained by quotations from the ancient Greek authors in the original language, beautifully illuminated; whilst many of the pages are adorned with flowers culled from the spots which the drawings represent.

Miss Contaxaki is the sole originator and authoress of it, assisted in its execution by native artists of Greece. The beauty of the finish, and the faithfulness and accuracy of the quotations from Hesiod, Homer, Xenophon, Plato, and others, show that the present sons and

daughters of the renowned ancient city of Minerva are not insensible of the glory that was once attached to her name, nor incapable of appreciating those monuments of art, science, and literature which still survive.

Feeling assured that, as an eminent classical scholar, you will fully appreciate the worth of the Classical Bouquet, I beg to present it, through you, to the Smithsonian Institution, in her name.

With sentiments of the highest respect, I remain your obedient servant,

CHAS. S. SPENCE.

Hon. LEWIS CASS,
*Secretary of State.*

WASHINGTON CITY, *November* 25, 1857.

SIR: I send you herewith a splendid album, together with a letter from Mr. Spence, explanatory of the circumstances of its execution and transmission to this country. I perform the duty of presenting it to the Smithsonian Institution with great pleasure, for it is a finished specimen of taste and art, worthy of a prominent place in your interesting collection. Mr. Spence has so well described it that any further reference to it on my part is unnecessary.

I am, dear sir, respectfully yours,

LEWIS CASS.

Prof. HENRY,
*Smithsonian Institution, Washington City.*

On motion, the work was referred to Professor Felton, to report a resolution expressive of the high appreciation of the gift on the part of the Board, and a letter of acknowledgment to Miss Contaxaki.

A letter was read from Sir George Simpson, expressing the desire and intention of the agents of the Hudson's Bay Company to co-operate with the Smithsonian Institution in procuring specimens of natural history, and in the prosecution of scientific researches.

The Board then adjourned to meet on Saturday, 30th instant, at 11 o'clock, a. m.

SATURDAY, JANUARY 30, 1858.

The Board of Regents met this day in the hall of the Institution at 11 o'clock a. m.

Present: Hon. J. C. Breckinridge, Vice President of the United States, Hon. J. A. Pearce, Hon. J. M. Mason, Hon. S. A. Douglas, Hon. W. H. English, Professor A. D. Bache, Professor C. C. Felton, Mr. Seaton, Treasurer, and the Secretary.

The Vice President took the chair.

The minutes were then read and approved.

The minutes of the last meeting of the "Establishment" were read for information, according to the by-laws of that body.

The Secretary stated to the Board the action of Congress at its last session relative to the construction of cases in the Smithsonian building for the government collections, and also the decision of the Attorney General respecting the law.

The Secretary then presented the annual report of the operations, expenditures, and condition of the Institution during the year 1857; which was read.

The Board then visited the rooms of the building, the collections, &c., and adjourned.

WASHINGTON, *April* 10, 1858.

The Board of Regents met this day at 11 o'clock a. m.

Present: Hon. J. M. Mason, Hon. S. A. Douglas, Hon. George E. Badger, Hon. Benj. Stanton, Hon. L. J. Gartrell.

Mr. Mason was called to the chair.

The minutes were read and approved.

The report of the Building Committee for the year 1857 was read and accepted.

The report of the Executive Committee was presented, together with the estimates for the year 1858.

Communications relative to the care of the government collections, the Wynn estate, the publications, investigations, and other operations of the Institution, were read.

On motion of Mr. Badger, the Secretary was directed to have the windows and other parts of the east wing of the building put in good order.

The following report from Professor Felton was presented:

REPORT ON THE PRESENT OF MISS CONTAXAKI.

The Secretary laid before the Board a volume received from Greece, and sent as a gift to the Smithsonian Institution, together with the letter of the Hon. Mr. Spence, late United States minister to Constantinople, to the Secretary of State, and the letter of the Hon. Lewis Cass, the Secretary of State, to Professor Henry, the Secretary of the Institution. The volume and the correspondence were referred to Professor Felton.

The volume was transmitted from Athens, Greece, through Mr.

Spence. It was designed and executed by a Greek lady of rare literary accomplishments, Miss Elizabeth B. Contaxaki, assisted by six Greek gentlemen, resident in Athens. It contains sketches of the principal ruins in that city, and views of the most famous historical places there and in other parts of Greece, correctly drawn and delicately colored, together with the passage, from the classic authors, in which the objects and places are described or referred to, translations of the passages, and extracts from English and French writers on the same subjects. The book is adorned with exquisitely drawn vignettes, and emblematic devices, and with specimens of the wild flowers which grow in the places described, carefully preserved, pressed, and attached to the leaves. The volume is bound in blue velvet, and tastefully decorated with silver. It is put in an elegantly and richly carved case, made of olive wood, from the olive groves near Athens, where stood, in ancient times, the academic groves of Plato's school. The body of the case is made of the trunk of the tree, and the ornamental portions, of the root, which is of darker and richer color. This beautiful gift, therefore, combines a great variety of objects, possessing, from their associations with the loftiest achievements of Hellenic genius, a deep and singular interest, and forming a most appropriate memorial of the country from which European art, education, philosophy, and letters took their rise.

Miss Contaxaki, the tasteful designer of this memorial, is a native of the island of Crete. At the time of the outbreak of the Greek revolution, her father was a landed proprietor there, and, in common with the great body of the Hellenic race, lost most of his property by the rapacity and tyranny of the Turks. His family was dispersed, and his daughter Elizabeth became an inmate in the family of the Rev. Dr. John H. Hill, the American missionary, who established himself in Athens, at the close of the war, for the benevolent and enlightened purpose of aiding the Greeks to reconstruct the shattered edifice of civilization, by establishing the school, which still continues to dispense the blessings of education among the children of its first pupils in that illustrious capital. Residing with Dr. Hill for many years, and educated chiefly under his superintendence and care, Elizabeth became known to many American travellers in the East, by whom she has often been mentioned with a cordial appreciation of her accomplishments and merits. Their personal relations have naturally inspired her with a warm interest in the United States, heightened by the sympathies of the citizens of America in the regeneration of her country, and the substantial aid furnished by them to Greece in

the hour of her utmost need. Recently Miss Contaxaki, after a visit to Constantinople, where she was received with distinction, has returned to her native island, which is under the government of the Pacha of Egypt, and, by her learning and ability, has succeeded in recovering, through the Moslem tribunal, a portion of her paternal estate.

The volume now presented to the Smithsonian Institution was sent to the great Paris Exhibition of 1855, where it excited much admiration, and gained a diploma for its accomplished author. She has now transmitted it for permanent deposit among the treasures of the Smithsonian Institution in the United States.

The Regents of the Institution accept the gift with great pleasure, not only on account of its rare beauty, its intrinsic value, and the many interesting associations it suggests with that famous city, called by Milton "the eye of Greece, mother of art and arms," but also as an expressive symbol of the hearty good will for the American republic, cherished by the enlightened spirit of a nation which has so honorably vindicated its right to the glories of an illustrious descent by re-establishing the institutions of freedom and learning on the soil where, in ancient times, they earliest flourished, and with unexampled splendor.

The committee recommends the adoption of the following resolutions by the Board:

*Resolved*, That the regents of the Smithsonian Institution accept, with gratitude, the splendid memorial volume presented by Miss Elizabeth B. Contaxaki, and that they recognize, in the beauty, taste, and art displayed in its general execution and style of its embellishment, a pleasing indication that the genius which placed the ancient Greeks at the head of the civilization of the world still survives in their descendants.

*Resolved*, That a copy of the above report, and of these resolutions, be transmitted, with a letter of acknowledgment from the Smithsonian Institution, to Miss Contaxaki, the accomplished donor.

On motion, the report was accepted and the resolutions adopted.

The Board then adjourned.

WEDNESDAY, MAY 19, 1858.

The Board met this day in the Vice President's room, United States Capitol, at 9½ o'clock.

Present: The Chancellor, Hon. Roger B. Taney, Hon. John C. Breckinridge, Vice President of the United States, Hon. J. M. Mason,

Hon. J. A. Pearce, Hon. S. A. Douglas, Hon. W. H. English, Hon. Benjamin Stanton, Prof. A. D. Bache, and the Secretary.

The minutes were read and approved.

Mr. Pearce explained the report of the Executive Committee and the estimates for the year 1858, and, on motion, they were adopted.

The following report was presented from Prof. Felton, of the committee to whom was referred the communication of Mr. J. M. Stanley:

REPORT ON THE PROPOSITION TO PURCHASE THE INDIAN GALLERY.

The Secretary laid before the Board a letter from Mr. J. M. Stanley, painter of the gallery of Indian portraits, now on deposit with the Smithsonian Institution, proposing to sell them to the Institution for the sum of twelve thousand dollars.

The committee appointed to consider and report upon the subject respectfully represent that, while they are fully sensible of the great historical and ethnological value of this collection of portraits, and of their characteristic excellence, they are yet of opinion that it would be inexpedient to withdraw the sum mentioned from the funds necessary to carry on the scheme of active operations, which has been so ably inaugurated and, thus far, so successfully executed. The income of the Smithsonian fund should not be scattered among different and disconnected objects, and the sum necessary for the purchase of the gallery cannot be spared, without crippling for a time, at least, the regular operations of the Institution.

Among the Contributions to Knowledge several important works relating to the aboriginal inhabitants of America have been published by the Institution and circulated over the civilized world.

Grammars and dictionaries of the Indian languages may be mentioned as of special interest, and of great value to the science of comparative philology. Their language will probably pass away, and the races speaking them disappear; but the works to which we allude will preserve, for future investigators of the science of philology, the characteristic form in which their thoughts were expressed, and will have an important bearing, not only on general ethnological inquiries, but on the philosophy of the human mind. These volumes have been eagerly sought and studied by the most eminent comparative philologists of Europe, and have, by universal consent, contributed materially to the increase and diffusion of knowledge among men in that department of science.

But though your committee are of opinion that the purchase of this

gallery would interfere with the present plan of operations, and that it would not so directly tend to the increase and diffusion of knowledge, they would earnestly express the opinion that, in a national point of view, the value of these portraits can hardly be overestimated.

They represent forty-three different tribes, and are taken from the leading personages in them. The artist has studied carefully the peculiarities of the tribes, the characteristic expressions of the individuals, their natural attitudes and actions, their several styles of costume and ornament, and has reproduced, with artistic skill, all these particulars. To this interesting enterprise he has given ten of the best years of his life, having traversed, with great labor and inconvenience, the principal regions inhabited by the subjects of his pencil. The number of portraits, including that of the artist, enumerated in the catalogue, is one hundred and fifty-two. The price for which they are offered is much below their real value, being less than $80 a piece. At the proposed rate the artist will receive no compensation for his time and labor, and barely enough to defray the cost of material, transportation, travelling expenses and insurance.

The number of the tribes represented so faithfully in this gallery, and the prominence of the individuals, render the collection very complete and satisfactory, as presenting a general view of the characteristic features of the red man. These circumstances make it important that the gallery should be preserved entire. Its peculiar value consists in its comprehensive character no less than in the fidelity of the individual details. Centuries hence, when most all of the tribes here represented shall have disappeared, as the New England tribes, for example, have nearly disappeared, this gallery will be an object of the profoundest interest to the student of man, the historian, the philosopher, and the statesman.

The relations between the government o' the United States and the Indian tribes form one of the most delicate and important subjects of national legislation. The government has not only endeavored to deal with the red men in a liberal and paternal spirit, but has done much towards illustrating their character and condition by the publication of costly works embodying the observations and researches of investigators who have devoted themselves to Indian studies. It appears to your committee that to purchase this collection, and to place it in some secure situation easy of access to visitors at the capital, would be an act worthy of the enlightened liberality of Con-

gress. The cost would be insignificant, and the value of the collection would increase in all future time. No place is so suitable for its permanent deposit as the city of Washington, and no guardianship so appropriate as that of the government of the United States.

Your committee recommend to the Board that the subject of the purchase of Mr. Stanley's Indian gallery be brought respectfully to the attention of Congress, as a measure eminently deserving a favorable consideration in its bearings upon the history of the aboriginal tribes of America, and as a monument of deep and lasting interest to the people of the United States.

The report was accepted, and laid on the table for the present.

The Secretary stated that Mr. Putnam having resigned the agency of the Smithsonian publications in New York, Messrs. D. Appleton & Co. had been appointed his successors.

The Secretary announced that since the last meeting of the Board the death of Dr. ROBERT HARE, of Philadelphia, had occurred, who was one of the principal benefactors of the Institution, and its first honorary member.

Professor Bache gave an account of the life, character, and scientific researches of Dr. Hare, and offered the following resolutions:

*Resolved*, That the Regents of the Smithsonian Institution have learned with deep regret the decease of one of the earliest and most venerated honorary members of the establishment, Robert Hare, M.D., of Philadelphia, late professor of chemistry in the University of Pennsylvania.

*Resolved*, That the activity and power of mind of Dr. Hare, shown through a long and successful career of physical research, the great fertility of invention, the happy adaptations to matters of practical life, and the successful grappling with questions of high theory in physical science, have placed him among the first in his country of the great contributors to knowledge, *clarum et venerabile nomen*.

*Resolved*, That while we deplore the loss of this great and good man, who has done so much to keep alive the flame of science in our country in past days, we especially mourn the generous patron of our Institution, the sympathizing friend of the youth of some of us, and the warm-hearted colleague of our manhood.

*Resolved*, That we offer to the bereaved family of Dr. Hare our sincere condolence in the loss which they have sustained by his death.

The resolutions were adopted.

The report of the Secretary for 1857 was then accepted.

Professor Felton, in behalf of the special committee to whom the llowing communication of Professor Henry of March 16, 1857, gether with accompanying documents, &c., were referred, presented report.

ɔMMUNICATION FROM PROF. HENRY, SECRETARY OF THE SMITHSONIAN INSTITUTION, RELATIVE TO A PUBLICATION BY PROF. MORSE.

GENTLEMEN: In the discharge of the important and responsible ities which devolve upon me as Secretary of the Smithsonian Insti- tion, I have found myself exposed, like other men in public positions, unprovoked attack and injurious misrepresentation. Many instances this, it may be remembered, occurred about two years ago, during e discussions relative to the organic policy of the Institution; but, ough very unjust, they were suffered to pass unnoticed, and gene- lly made, I presume, no lasting impression on the public mind.

During the same controversy, however, there was one attack made ɔon me of such a nature, so elaborately prepared and widely circu- ted, by my opponents, that, though I have not yet publicly noticed , I have from the first thought it my duty not to allow it to go un- ıswered. I allude to an article in a periodical entitled "Shaffner's ɛlegraph Companion," from the pen of Prof. S. F. B. Morse, the lebrated inventor of the American electro-magnetic telegraph. In is, not my scientific reputation merely, but my moral character was ɔintedly assailed; indeed, nothing less was attempted than to prove ıat in the testimony which I had given in a case where I was at ost but a reluctant witness, I had consciously and wilfully deviated om the truth, and this, too, from unworthy and dishonorable otives.

Such a charge, coming from such a quarter, appeared to me then, as appears now, of too grave a character and too serious a consequence ı be withheld from the notice of the Board of Regents. I, therefore, resented the matter unofficially to the Chancellor of the Institution, hief Justice Taney, and was advised by him to allow the matter to st until the then existing excitement with respect to the organiza- on of the Institution should subside, and that in the meantime the aterials for a refutation of the charge might be collected and pre- ıred, to be brought forward at the proper time, if I should think it ɛcessary.

The article of Mr. Morse was published in 1855, but at the session the Board in 1856 I was not prepared to present the case properly

to your consideration, and I now (1857) embrace the first opportunity of bringing the subject officially to your notice, and asking from you an investigation into the justice of the charges alleged against me. And this I do most earnestly, with the desire that when we shall all have passed from this stage of being, no imputation of having attempted to evade in silence so grave a charge shall rest on *me*, nor on *you*, of having continued to devolve upon me duties of the highest responsibility, after that was known to some of you individually, which, if true, should render me entirely unworthy of your confidence. Duty to the Board of Regents, as well as regard to my own memory, to my family, and to the truth of history, demands that I should lay this matter before you, and place in your hands the documents necessary to establish the veracity of my testimony, so falsely impeached, and the integrity of my motives, so wantonly assailed.

My life, as is known to you, has been principally devoted to science, and my investigations in different branches of physics have given me some reputation in the line of original discovery. I have sought, however, no patent for inventions, and solicited no remuneration for my labors, but have freely given their results to the world, expecting only, in return, to enjoy the consciousness of having added, by my investigations, to the sum of human knowledge, and to receive the credit to which they might justly entitle me.

I commenced my scientific career about the year 1828, with a series of experiments in electricity, which were continued at intervals up to the period of my being honored by election to the office of Secretary of this Institution. The object of my researches was the advancement of science, without any special or immediate reference to its application to the wants of life or useful purposes in the arts. It is true, nevertheless, that some of my earlier investigations had an important bearing on the electro-magnetic telegraph, and brought the science to that point of development at which it was immediately applicable to Mr. Morse's particular invention.

In 1831 I published a brief account of these researches, in which I drew attention to the fact of their applicability to the telegraph; and in 1832, and subsequently, exhibited experiments illustrative of the application of the electro-magnet to the transmission of power to a distance, for producing telegraphic and other effects. The results I had published were communicated to Mr. Morse, by his scientific assistant, Dr. Gale, as will be shown on the evidence of the latter; and the facts which I had discovered were promptly applied in rendering effective the operation of his machine.

In the latter part of 1837 I became personally acquainted with Mr. Morse, and at that time, and afterwards, freely gave him information in regard to the scientific principles which had been the subject of my investigations. After his return from Europe, in 1839, our intercourse was renewed, and continued uninterrupted till 1845. In that year, Mr. Vail, a partner and assistant of Mr. Morse, published a work purporting to be a history of the Telegraph, in which I conceived manifest injustice was done me. I complained of this to a mutual friend, and subsequently received an assurance from Mr. Morse that if another edition were published, all just ground of complaint should be removed. A new emission of the work, however, shortly afterwards appeared, without change in this respect, or further reference to my labors. Still I made no public complaint, and set up no claims on account of the telegraph. I was content that my published researches should remain as material for the history of science, and be pronounced upon, according to their true value, by the scientific world.

After this, a series of controversies and lawsuits having arisen between rival claimants for telegraphic patents, I was repeatedly appealed to, to act as expert and witness in such cases. This I uniformly declined to do, not wishing to be in any manner involved in these litigations, but was finally compelled, under legal process, to return to Boston from Maine, whither I had gone on a visit, and to give evidence on the subject. My testimony was given with the statement that I was not a willing witness, and that I labored under the disadvantage of not having access to my notes and papers, which were in Washington. That testimony, however, I now reaffirm to be true in every essential particular. It was unimpeached before the court, and exercised an influence on the final decision of the question at issue.

I was called upon on that occasion to state, not only what I had published, but what I had done, and what I had shown to others in regard to the telegraph. It was my wish, in every statement, to render Mr. Morse full and scrupulous justice. While I was constrained, therefore, to state that he had made no discoveries in science, I distinctly declared that he was entitled to the merit of combining and applying the discoveries of others, in the invention of the best practical form of the magnetic telegraph. My testimony tended to establish the fact that, though not entitled to the exclusive use of the electro-magnet for telegraphic purposes, he was entitled to his particular machine, register, alphabet, &c. As this, however, did not meet the full requirements of Mr. Morse's comprehensive claim, I could not but be aware that, while

aiming to depose nothing but truth and the whole truth, and while so doing being obliged to speak of my own discoveries, and to allude to the omissions in Mr. Vail's book, I might expose myself to the possible, and, as it has proved, the actual, danger of having my motives misconstrued and my testimony misrepresented. But I can truly aver, in accordance with the statement of the counsel, Mr. Chase, (now governor of Ohio,) that I had no desire to arrogate to myself undue merit, or to detract from the just claims of Mr. Morse.

I have the honor to be your obedient servant,

JOSEPH HENRY.

To the Board of Regents.

The Chancellor, Chief Justice Taney, corroborated Prof. Henry's statement as to his advising a delay in noticing the publication referred to until the public mind should be more settled in regard to the policy of the Institution, and the discussions which had arisen in Congress in reference to it should be ended.

He stated that it would be seen by the report of the decision of the Supreme Court, in the case in which Professor Henry was a witness, that, in the opinion of the court, Professor Morse had produced no testimony that could invalidate the testimony of Professor Henry, or impair in any degree its weight, and gave full credit to it in the udgment it pronounced.

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REPORT OF THE SPECIAL COMMITTEE OF THE BOARD OF REGENTS ON THE COMMUNICATION OF PROFESSOR HENRY.

Professor Henry laid before the Board of Regents of the Smithsonian Institution a communication relative to an article in Shaffner's Telegraph Companion, bearing the signature of Samuel F. B. Morse, the inventor of the American electro-magnetic telegraph. In this article serious charges are brought against Professor Henry, bearing upon his scientific reputation and his moral character. The whole matter having been referred to a committee of the Board, with instructions to report on the same, the committee have attended to the duty assigned to them, and now submit the following brief report, with resolutions accompanying it.

The committee have carefully examined the documents relating to the subject, and especially the article to which the communication of Professor Henry refers. This article occupies over ninety pages, filling an entire number of Shaffner's Journal, and purports to be "a defence

against the injurious deductions drawn from the deposition of Professor Joseph Henry, (in the several telegraph suits,) with a critical review of said deposition, and an examination of Professor Henry's alleged discoveries bearing upon the electro-magnetic telegraph."

The first thing which strikes the reader of this article is, that its title is a misnomer. It is simply an assault upon Professor Henry; an attempt to disparage his character; to deprive him of his honors as a scientific discoverer; to impeach his credibility as a witness and his integrity as a man. It is a disingenuous piece of sophistical argument, such as an unscrupulous advocate might employ to pervert the truth, misrepresent the facts, and misinterpret the language in which the facts belonging to the other side of the case are stated.

Mr. Morse charges that the deposition of Professor Henry "contains imputations against his (Morse's) personal character," which it does not, and assumes it as a duty "to expose the utter non-reliability of Professor Henry's testimony;" that testimony being supported by the most competent authorities, and by the history of scientific discovery. He asserts that he "is not indebted to him (Professor Henry) for any discovery in science bearing on the telegraph," he having himself acknowledged such indebtedness in the most unequivocal manner, and the fact being independently substantiated by the testimony of SEARS C. WALKER, and the statement of Mr. Morse's own associate, Dr. GALE. Mr. Morse further maintains, that all discoveries bearing upon the telegraph were made, not by Professor Henry, but by others, and prior to any experiments of Professor Henry in the science of electro-magnetism; contradicting in this proposition the facts in the history of scientific discovery perfectly established and recognized throughout the scientific world.

The essence of the charges against Prof. Henry is, that he gave false testimony in his deposition in the telegraph cases, and that he has claimed the credit of discoveries in the sciences bearing upon the electro-magnetic telegraph which were made by previous investigators; in other words, that he has falsely claimed what does not belong to him, but *does* belong to others.

Professor Henry, as a private man, might safely have allowed such charges to pass in silence. But standing in the important position which he occupies, as the chief executive officer of the Smithsonian Institution; and regarding the charges as undoubtedly containing an impeachment of his moral character, as well as of his scientific reputation; and justly sensitive, not only for his own honor, but for the honor of the Institution, he has a right to ask this Board to consider

the subject, and to make their conclusions a matter of record, which may be appealed to hereafter should any question arise with regard to his conduct in the premises.

Your committee do not conceive it to be necessary to follow Mr. Morse through all the details of his elaborate attack. Fortunately, a plain statement of a few leading facts will be sufficient to place the essential points of the case in a clear light.

The deposition already referred to was reluctantly given, and under the compulsion of legal process, by Prof. Henry, before the Hon. Geo. S. Hillard, United States commissioner, on the 7th of September, 1849.

The following is the statement of the Hon. S. P. CHASE, (now governor of Ohio,) one of the counsel in the telegraph cases, in a letter to Professor Henry, dated Columbus, Ohio, November 26, 1856:

In the year 1849, I was professionally employed in the defence of certain gentlemen engaged in the business of telegraphing between Louisville and New Orleans, against whom a bill of complaint had been filed in the Circuit Court of the United States for the district of Kentucky. The object of the bill was to restrain the defendants, my clients, from the use in telegraphing of a certain instrument called the Columbian Telegraph, on the ground that it was an infringement upon the rights of the complainants under the patents granted to Professor Morse. It therefore became my duty, in the preparation of their defence, to ascertain the precise nature and extent of their rights. With this view I called upon you, in August or September of that year, for your deposition. It was taken before George S. Hillard, esq., a United States commissioner for the district of Massachusetts, in Boston. I remember very well that you were unwilling to be involved in the controversy, even as a witness, and that you only submitted to be examined in compliance with the requirements of law. Not one of your statements was volunteered. They were all called out by questions propounded either verbally or in writing. I was not sufficiently familiar at the time with the precise merits of the case to know what would or would not be important, and therefore insisted on a full statement, not merely of the general history of electro-magnetism as applied to telegraphing, but of all your own discoveries in that science having relation to the same art, and of all that had passed between yourself and Professor Morse connected with these discoveries or with the telegraph. You could not have refused to respond to the questions propounded, without subjecting yourself to judicial animadversion and constraint. Nothing in what you testified, or your manner of testifying, suggested to me the idea that you were animated by any desire to arrogate undue merit to yourself, or to detract from the just claims of Professor Morse.

S. P. CHASE.

Previous to this deposition, Mr. Morse, as appears from his own letters and statements, entertained for Prof. Henry the warmest feelings of personal regard, and the highest esteem for his character as a

scientific man. In a letter, dated April 24, 1839, he thanks Prof. Henry for a copy of his "valuable contributions," and says, "I perceive many things (in the contributions) of great interest to me in my telegraphic enterprise." Again, in the same letter, speaking of an intended visit to the Professor at Princeton, he says: "I should come as a learner, and could bring no 'contributions' to your stock of experiments of any value." And still further: "I think that you have pursued an original course of experiments, and discovered facts more immediately bearing upon my invention than any that have been published abroad."

It appears, from Mr. Morse's own statement, that he had at least two interviews with Prof. Henry—one in May, 1839, when he passed the afternoon and night with him, at Princeton; and another in February, 1844—both of them for the purpose of conferring with him on subjects relating to the telegraph, and evidently with the conviction, on Mr. Morse's part, that Prof. Henry's investigations were of great importance to the success of the telegraph.

As late as 1846, after Mr. Morse had learned that some dissatisfaction existed in Prof. Henry's mind in regard to the manner in which his researches in electricity had been passed over by Mr. Vail, an assistant of Mr. Morse, and the author of a history of the American magnetic telegraph, Mr. Morse, in an interview with Prof. Henry, at Washington, said, according to his own account, "Well, Prof. Henry, I will take the earliest opportunity that is afforded me in anything I may publish to have justice done to your labors; for I do not think that justice has been done you, either in Europe or this country."

Again, in 1848, when Prof. Walker, of the Coast Survey, made his report on the theory of Morse's electro-magnetic telegraph, in which the expression occurred, "the helix of a soft iron magnet, prepared after the manner first pointed out by Prof. Henry," Mr. Morse, to whom the report was submitted, said: "I have now the long wished for opportunity to do justice publicly to Henry's discovery bearing on the telegraph." And in a note prepared by him, and intended to be printed with Prof. Walker's report, he says: "The allusion you make to the helix of a soft iron magnet, prepared after the manner first pointed out by Prof. Henry, gives me an opportunity, of which I gladly avail myself, to say that I think that justice has not yet been done to Prof. Henry, either in Europe or in this country, for the discovery of a scientific fact, which, in its bearing on telegraphs, whether of the magnetic needle or electro-magnet order, is of the greatest importance."

He then proceeds to give a historical synopsis, showing that, although suggestions had been made and plans devised by Soemmering, in 1811, and by Ampère, in 1820, yet that the experiments of Barlow, in 1824, had led that investigator to pronounce "the idea of an electric telegraph to be chimerical"—an opinion that was, for the time, acquiesced in by scientific men. He shows that, in the interval between 1824 and 1829, no further suggestions were made on the subject of electric telegraphs. But he proceeds—"In 1830, Prof. Henry, assisted by Dr. Ten Eyck, while engaged in experiments on the application of the principle of the galvanic multiplier to the development of great magnetic power in soft iron, made the important discovery that a battery of intensity overcame that resistance in a long wire which Barlow had announced as an insuperable bar to the construction of electric telegraphs. Thus was opened the way for fresh efforts in devising a practicable electric telegraph; and Baron Schilling, in 1832, and Professors Gauss and Weber, in 1833, had ample opportunity to learn of Henry's discovery, and avail themselves of it, before they constructed their needle telegraphs." And, while claiming for himself that he was "the first to propose the use of the electro-magnet for telegraphic purposes, and the first to construct a telegraph on the basis of the electro-magnet," yet he adds, "*to Professor Henry is unquestionably due the honor of the discovery of a principle which proves the practicability of exciting magnetism through a long coil, or at a distance, either to deflect a needle or to magnetize soft iron.*"

What Mr. Morse here describes as "a principle," the discovery of which is unquestionably due to Professor Henry, is the law which first made it possible to work the telegraphic machine invented by Mr. Morse, and for the knowledge of which Mr. Morse was indebted to Professor Henry, as is positively asserted by his associate, Dr. GALE. This gentleman, in a letter, dated Washington, April 7, 1856, makes the following conclusive statement:

WASHINGTON, D. C., *April* 7, 1856.

SIR: In reply to your note of the 3d instant, respecting the Morse telegraph, asking me to state definitely the condition of the invention when I first saw the apparatus in the winter of 1836, I answer: This apparatus was Morse's original instrument, usually known as the type apparatus, in which the types, set up in a composing stick, were run through a circuit breaker, and in which the battery was the cylinder battery, with a single pair of plates. This arrangement also had another peculiarity, namely, it was the electro-magnet used by Moll, and shown in drawings of the older works on that subject, having only a few turns of wire in the coil which surrounded the poles or arms of the magnet. The sparseness of the wires in the magnet coils and the use

of the single cup battery were to me, on the first look at the instrument, obvious marks of defect, and I accordingly suggested to the Professor, without giving my reasons for so doing, that a battery of many pairs should be substituted for that of a single pair, and that the coil on each arm of the magnet should be increased to many hundred turns each; which experiment, if I remember aright, was made on the same day with a battery and wire on hand, furnished I believe by myself, and it was found that while the original arrangement would only send the electric current through a few feet of wire, say 15 to 40, the modified arrangement would send it through as many hundred. Although I gave no reasons at the time to Professor Morse for the suggestions I had proposed in modifying the arrangement of the machine, I did so afterwards, and referred in my explanations to the paper of Professor Henry, in the 19th volume of the American Journal of Science, page 400 and onward. It was to these suggestions of mine that Professor Morse alludes in his testimony before the circuit court for the eastern district of Pennsylvania, in the trial of B. B. French and others *vs.* Rogers and others.—See printed copy of Complainant's Evidence, page 168, beginning with the words "Early in 1836 I procured 40 feet of wire," &c., and page 169, where Professor Morse alludes to myself and compensation for services rendered to him, &c.

At the time I gave the suggestions above named, Professor Morse was not familiar with the then existing state of the science of electromagnetism. Had he been so, or had he read and appreciated the paper of Henry, the suggestions made by me would naturally have occurred to his mind as they did to my own. But the principal part of Morse's great invention lay in the mechanical adaptation of a power to produce motion, and to increase or relax at will. It was only necessary for him to know that such a power existed for him to adapt mechanism to direct and control it.

My suggestions were made to Professor Morse from inferences drawn by reading Professor Henry's paper above alluded to. Professor Morse professed great surprise at the contents of the paper when I showed it to him, but especially at the remarks on Dr. Barlow's results respecting telegraphing, which were new to him, and he stated at the time that he was not aware that any one had even conceived the idea of using the magnet for such purposes.

With sentiments of esteem, I remain yours truly,

L. D. GALE.

Prof. JOS. HENRY,
*Secretary of the Smithsonian Institution.*

It further appears, that principally for the information thus communicated Mr. Morse assigned to Dr. Gale an interest in the telegraph, which he afterwards purchased back for $15,000, as appears from the following letter of Dr. Gale:

PATENT OFFICE, *August* 5, 1857.

DEAR SIR: In reply to yours of this date, respecting the interest I once possessed in Morse's telegraph patent, secured to me by the said Morse, as alluded to by him in his statement to the Commissioner of

Patents, I would simply state that the part I owned when I entered the service of the government in this office was orginally given me by the said Morse for services rendered him in making his invention practically effective in sending currents through long distances, &c., and that the said interest was retransferred to the said Morse for the sum of fifteen thousand dollars.

Respectfully,

L. D. GALE.

Professor HENRY,
*Secretary Smithsonian Institution.*

It thus appears, both from Mr. Morse's own admission down to 1848, and from the testimony of others most familiar with the facts, that Professor Henry discovered the law, or "principle," as Mr. Morse designates it, which was necessary to make the practical working of the electro-magnetic telegraph at considerable distances possible; that Mr. Morse was first informed of this discovery by Dr. Gale; that he availed himself of it at once, and that it never occurred to Mr. Morse to deny this fact until after 1848. He had steadily and fully acknowledged the merits and genius of Mr. Henry, as the discoverer of facts and laws in science of the highest importance to the success of his long-cherished invention of a magnetic telegraph. Mr. Henry was the discoverer of a principle, Mr. Morse was the inventor of a machine, the object of which was to record characters at a distance, to convey intelligence, in other words, to carry into execution the idea of an electric telegraph. But there were obstacles in the way which he could not overcome until he learned the discoveries of Professor Henry, and applied them to his machine. These facts are undeniable. They constitute a part of the history of science and invention. They were true in 1848, they were equally true in 1855, when Professor Morse's article was published. We give a passage here from the deposition of SEARS C. WALKER, in the case of French *vs.* Rogers, Respondent's Evidence, page 199, bearing upon this whole subject:

"In consequence of some statements made by me in my official reports relative to the invention of the receiving magnet, a question arose between Mr. Morse and myself as to the origin of this invention. It was amicably discussed by Mr. Morse, Professor Henry, Dr. Gale, and myself, with Professor Henry's article, alluded to in answer to the second question before us. The result of the interview was conclusive to my mind that Professor Henry was the sole discoverer of the law on which the intensity magnet depends for its power of sending the galvanic current through a long circuit. I was also led to conclude that Mr. Morse, in the course of his own researches and experiments before he had read Professor Henry's article, before alluded to, had encountered the same difficulty Mr. Barlow and those who preceded him had encountered, that is, the impossibility of forcing

the galvanic current through a long telegraph line. His own personal researches had not overcome this obstacle. They were made in the laboratory of the New York University. I also learned at the same time, by the conversations above stated, that he only overcame this obstacle by constructing a magnet on the principle invented by Professor Henry, and described in his article in Silliman's Journal. His attention was directed to it by Dr. Gale."

What changed Mr. Morse's opinion of Professor Henry, not only as a scientific investigator, but as a man of integrity, after the admissions of his indebtedness to his researches, and the oft repeated expressions of warm personal regard? It appears that Mr. Morse was involved in a number of lawsuits, growing out of contested claims to the right of using electricity for telegraphic purposes. The circumstances under which Professor Henry, as a well known investigator in this department of physics, was summoned by one of the parties to testify have already been stated. The testimony of Mr. Henry, while supporting the claims of Mr. Morse as the inventor of an admirable invention, denied to him the additional merit of being a discoverer of new facts or laws of nature, and to this extent, perhaps, was considered unfavorable to some part of the claim of Mr. Morse to an *exclusive* right to employ the electro-magnet for telegraphic purposes. Professor Henry's deposition consists of a series of answers to verbal, as well as written, interrogatories propounded to him, which were not limited to his published writings, or the subject of electricity, but extended to investigations and discoveries in general having a bearing upon the electric telegraph. He gave his testimony at a distance from his notes and manuscripts, and it would not have been surprising if inaccuracies had occurred in some parts of his statement; but all the material points in it are sustained by independent testimony, and that portion which relates directly to Mr. Morse agrees entirely with the statement of his own assistant, Dr. Gale. Had his deposition been objectionable, it ought to have been impeached before the Court; but this was not attempted; and the following tribute to Professor Henry by the judge, in delivering the opinion of the Supreme Court of the United States, indicates the impression made upon the Court itself by all the testimony in the case: "It is due to him to say that no one has contributed more to enlarge the knowledge of electro-magnetism, and to lay the foundations of the great invention of which we are speaking, than the Professor himself."

Professor Henry's answers to the first and second interrogatories present a condensed history of the progress of the science of electro-magnetism, as connected with telegraphic communication, embracing

an account of the discoveries of Oersted, Arago, Davy, Ampère; of the investigations by Barlow and Sturgeon; of his own researches, commenced in 1828, and continued in 1829, 1830, and subsequently. The details of his experiments and their results, though brief, are very precise. There is abundant evidence to show that Professor Henry's experiments and illustrations at Albany, and subsequently at Princeton, proved, and were declared at the time by him to prove, that the electric telegraph was now practicable; that the electro-magnet might be used to produce mechanical effects at a distance adequate to making signals of various kinds, such as ringing bells, which he practically illustrated. In proof of this, we quote a letter to Professor Henry, from Professor JAMES HALL, of Albany, late president of the American Association for the Advancement of Science:

JANUARY 19, 1856.

DEAR SIR: While a student of the Rensselaer School, in Troy, New York, in August, 1832, I visited Albany with a friend, having a letter of introduction to you from Professor Eaton. Our principal object was to see your electro-magnetic apparatus, of which we had heard much, and at the same time the library and collections of the Albany Institute.

You showed us your laboratory in a lower story or basement of the building, and in a larger room in an upper story some electric and galvanic apparatus, with various philosophical instruments. In this room, and extending around the same, was a circuit of wire stretched along the wall, and at one termination of this, in the recess of a window, a bell was fixed, while the other extremity was connected with a galvanic apparatus.

You showed us the manner in which the bell could be made to ring by a current of electricity, transmitted through this wire, and you remarked that this method might be adopted for giving signals, by the ringing of a bell at the distance of many miles from the point of its connexion with the galvanic apparatus.

All the circumstances attending this visit to Albany are fresh in my recollection, and during the past years, while so much has been said respecting the invention of electric telegraphs, I have often had occasion to mention the exhibition of your electric telegraph in the Albany Academy, in 1832.

If at any time or under any circumstances this statement can be of service to you in substantiating your claim to such a discovery at the period named, you are at liberty to use it in any manner you please, and I shall be ready at all times to repeat and sustain what I have here stated, with many other attendant circumstances, should they prove of any importance.

I remain very sincerely and respectfully yours,

JAMES HALL.

Professor JOSEPH HENRY.

In his deposition, Prof. Henry's statements are within what he ght fairly have claimed. But he is a man of science, looking for other reward than the consciousness of having done something for promotion, and the reputation which the successful prosecution of entific investigations and discoveries may justly be expected to give. his public lectures and published writings he has often pointed out identally the possibility of applying the facts and laws of nature covered by him to practical purposes; he has freely communicated ormation to those who have sought it from him, among whom has n Mr. Morse himself, as appears by his own acknowledgments. t he has never applied his scientific discoveries to practical ends for own pecuniary benefit. It was natural, therefore, that he should l a repugnance to taking any part in the litigation between rival entors, and it was inevitable that, when forced to give his testi- ny, he should distinctly point out what was so clear in his own nd and is so fundamental a fact in the history of human progress, distinctive functions of the discoverer and the inventor who ap- es discoveries to practical purposes in the business of life.

Mr. Henry has always done full justice to the invention of Mr. rse. While he could not sanction the claim of Mr. Morse to the *lusive* use of the electro-magnet, he has given him full credit for mechanical contrivances adapted to the application of his invention. proof of this we refer to his deposition, and present also the following tement of Hon. CHARLES MASON, Commissioner of Patents, taken m a letter addressed by him to Prof. Henry, dated March 31, 1856:

U. S. PATENT OFFICE, *March* 31, 1856.

SIR: Agreeably to your request I now make the following statent:

Some two years since, when an application was made for an exten- n of Prof. Morse's patent, I was for some time in doubt as to the pro- ety of making that extension. Under these circumstances I con- ted with several persons, and among others with yourself, with a w particularly to ascertain the amount of invention fairly due to of. Morse.

The result of my inquiries was such as to induce me to grant the ension. I will further say that this was in accordance with your press recommendation, and that I was probably more influenced by s recommendation, and the information I obtained from you, than any other circumstance, in coming to that conclusion.

I am, sir, yours very respectfully,

CHARLES MASON.

Prof. J. HENRY.

To sum up the results of the preceding investigation in a few words

We have shown that Mr. Morse himself has acknowledged the value of the discoveries of Prof. Henry to his electric telegraph; that his associate and scientific assistant, Dr. Gale, has distinctly affirmed that these discoveries were applied to his telegraph, and that previous to such application it was impossible for Mr. Morse to operate his instrument at a distance; that Prof. Henry's experiments were witnessed by Prof. Hall and others in 1832, and that these experiments showed the possibility of transmitting to a distance a force capable of producing mechanical effects adequate to making telegraphic signals; that Mr. Henry's deposition of 1849, which evidently furnished the motive for Mr. Morse's attack upon him, is strictly correct in all the historical details, and that, so far as it relates to Mr. Henry's own claim as a discoverer, is within what he might have claimed with entire justice; that he gave the deposition reluctantly, and in no spirit of hostility to Mr. Morse; that on that and other occasions he fully admitted the merit of Mr. Morse as an inventor; and that Mr. Morse's patent was extended through the influence of the favorable opinion expressed by Professor Henry.

Your committee come unhesitatingly to the conclusion that Mr. Morse has failed to substantiate any one of the charges he has made against Prof. Henry, although the burden of proof lay upon him; and that all the evidence, including the unbiased admissions of Mr. Morse himself, is on the other side. Mr. Morse's charges not only remain unproved but they are positively disproved.

Your committee recommend the adoption of the following resolutions:

*Resolved*, That Professor Morse has not succeeded in refuting the statements of Professor Henry in the deposition given by the latter in 1849; that he has not proved any one of the accusations against Prof. Henry made in the article in Shaffner's Telegraph Companion in 1855, and that he has not disproved any one of his own admissions in regard to Prof. Henry's discoveries in electro-magnetism, and their importance to his own invention of the electro-magnetic telegraph.

*Resolved*, That there is nothing in Professor Morse's article that diminishes, in the least, the confidence of this Board in the integrity of Prof. Henry, or in the value of those great discoveries which have placed his name among those of the most distinguished cultivators of science, and have done much to exalt the scientific reputation of the country.

*Resolved*, That this report, with the resolutions, be recorded in the Proceedings of the Board of Regents of the Institution.

The report was accepted and the resolutions were unanimously adopted. The Board then adjourned *sine die.*

## APPENDIX TO THE REPORT OF THE COMMITTEE.

### STATEMENT OF PROFESSOR HENRY IN RELATION TO THE HISTORY OF THE ELECTRO-MAGNETIC TELEGRAPH.

In the beginning of my deposition I was requested to give a sketch of the history of electro-magnetism having a bearing on the telegraph, and the account I then gave from memory I have since critically examined and find it fully corroborated by reference to the original authorities. My sketch, which was the substance of what I had been in the habit of giving in my lectures, was necessarily very concise, and almost exclusively confined to one class of facts, namely, those having a direct bearing on Mr. Morse's invention, and my paper in Silliman's Journal was likewise very brief and intended merely for scientific men. In order, therefore, to set forth more clearly in what my own improvements consisted it may be proper to give a few additional particulars respecting some points in the progress of discovery, illustrated by wood cuts.

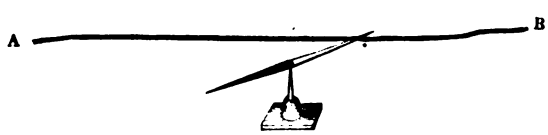
There are several forms of the electrical telegraph: first, that in which frictional electricity has been proposed to produce sparks and motion of pith balls at a distance.

Second, that in which galvanism has been employed to produce signals by means of bubbles of gas from the decomposition of water.

Third, that in which electro-magnetism is the motive power to produce motion at a distance; and again, of the latter there are two kinds of telegraph, those in which the intelligence is indicated by the motion of a magnetic needle, and those in which sounds and permanent signs are made by the attraction of an electro-magnet. The latter is the class to which Mr. Morse's invention belongs. The following is a brief exposition of the several steps which led to this form of the telegraph.

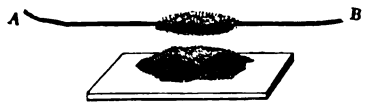
The first essential fact, as I stated in my testimony, which rendered the electro-magnetic telegraph possible was discovered by Oersted, in the winter of 1819–'20. It is illustrated by figure 1, in which the magnetic needle is deflected by the action of a current of galvanism transmitted through the wire A B. (See Annals of Philosophy, vol. 16, page 273.)

Fig. 1.



The second fact of importance, discovered in 1820, by Arago and Davy, is illustrated in figure 2. It consists in this, that while a current of galvanism is passing through a copper wire A B, it is magnetic, it attracts iron filings and not those of copper or brass, and is capable of developing magnetism in soft iron. (See Annales de Chimie, vol. 15, page 94.)

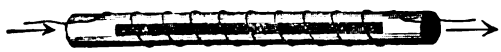
Fig. 2.




The next important discovery, also made in 1820, by Ampère, was that two wires through which galvanic currents are passing in the same direction attract, and in opposite direction repel, each other. On this fact Ampère founded his celebrated theory, that magnetism consists merely in the attraction of electrical currents revolving at right angles to the line joining the two poles of the magnet. The magnetisation of a bar of steel or iron, according to this theory, consists in establishing within the metal by induction a series of electrical currents, all revolving in the same direction at right angles to the axis or length of the bar. (See Annales de Chimie, vol. 15, page 69.)

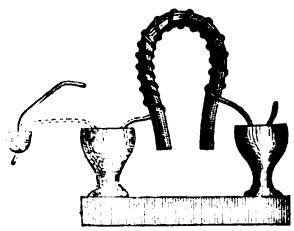
It was this theory which led Arago, as he states, to adopt the method of magnetizing sewing needles and pieces of steel wire, shown in figure 3. This method consists in transmitting a current of electricity through a helix surrounding the needle or wire to be magnetized. For the purpose of insulation the needle was inclosed in a glass tube, and the several turns of the helix were at a distance from each other to insure the passage of electricity, through the whole length of the wire, or, in other words, to prevent it from seeking a shorter passage by cutting across from one spire to another. The helix employed by Arago obviously approximates the arrangement required by the theory of Ampère, in order to develop by induction the magnetism of the iron. By an attentive perusal of the original account of the experiments of Arago, given in the Annales de Chimie et Physique, vol. XV, 1820, page 93, it will be seen that, properly speaking, he made no electro-magnet, as has been asserted by Morse and others; his experiments were confined to the magnetism of iron filings, to sewing needles and pieces of steel wire of the diameter of a millimetre, or of about the thickness of a small knitting needle. (See Annales de Chimie, vol. 15, page 95.)

Fig. 3.



Mr. Sturgeon, in 1825, made an important step in advance of the experiments of Arago, and produced what is properly known as the electro-magnet. He bent a piece of iron *wire* into the form of a horse-shoe, covered it with varnish to insulate it, and surrounded it with a helix, of which the spires were at a distance. When a current of galvanism was passed through the helix from a small battery of a single cup the iron wire became magnetic, and continued so during the passage of the current. When the current was interrupted the magnetism disappeared, and thus was produced the first temporary soft iron magnet.

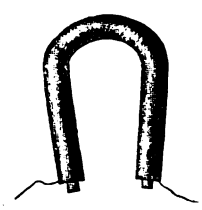
Fig. 4.



The electro-magnet of Sturgeon is shown in figure 4, which is an exact copy from the drawing in the Transactions of the Society for the Encouragement of Arts, &c., vol. XLIII. By comparing figures 3 and 4 it will be seen that the helix employed by Sturgeon was of the same kind as that used by Arago; instead, however, of a straight steel wire inclosed in a tube of glass, the former employed a bent wire of soft iron. The difference in the arrangement at first sight might appear to be small, but the difference in the results produced was important, since the temporary magnetism developed in the arrangement of Sturgeon was sufficient to support a weight of several pounds, and an instrument was thus produced of value in future research.

The next improvement was made by myself. After reading an account of the galvanometer of Schweigger, the idea occurred to me that a much nearer approximation to the requirements of the theory of Ampère could be attained by insulating the conducting wire itself, instead of the rod to be magnetized, and by covering the whole surface of the iron with a series of coils in close contact. This was effected by insulating a long wire with silk thread, and winding this around the rod of iron in close coils from one end to the other. The same principle was extended by employing a still longer insulated wire, and winding several strata of this over the first, care being taken to insure the insulation between each stratum by a covering of silk ribbon. By this arrangement the rod was surrounded by a compound helix formed of a long wire of many coils, instead of a single helix of a few coils, (figure 5.)

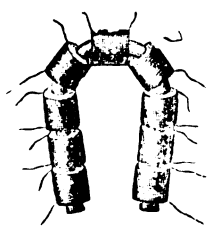
Fig. 5.



In the arrangement of Arago and Sturgeon the several turns of wire were not precisely at right angles to the axis of the rod, as they should be, to produce the effect required by the theory, but slightly oblique, and therefore each tended to develop a separate magnetism not coincident with the axis of the bar. But in winding the wire over itself the obliquity of the several turns compensated each other, and the resultant action was at right angles to the bar. The arrangement then introduced by myself was superior to those of Arago and Sturgeon, first in the greater multiplicity of turns of wire, and second in the better application of these turns to the development of magnetism. The power of the instrument, with the same amount of galvanic force, was by this arrangement several times increased.

The maximum effect, however, with this arrangement and a single battery was not yet obtained. After a certain length of wire had been coiled upon the iron the power diminished with a further increase of the number of turns. This was due to the increased resistance which the longer wire offered to the conduction of electricity. Two methods of improvement therefore suggested themselves. The first consisted, not in increasing the length of the coil, but in using a number of separate coils on the same piece of iron. By this arrangement the resistance to the conduction of the electricity was diminished and a greater quantity made to circulate around the iron from the same battery. The second method of producing a similar result consisted in increasing the number of elements of the battery, or, in other words, the projectile force of the electricity, which enabled it to pass through an increased number of turns of wire, and thus, by increasing the length of the wire, to develop the maximum power of the iron.

Fig. 6.



To test these principles on a larger scale the experimental magnet was constructed, which is shown in figure 6. In this a number of compound helices were placed on the same bar, their ends left projecting, and so numbered that they could be all united into one long helix, or variously combined in sets of lessser length.

From a series of experiments with this and other magnets it was proved that, in order to produce the greatest amount of magnetism from a battery of a single cup, a number of helices is required; but when a compound battery is used then one long wire must be employed, making many turns around the iron, the length of wire and

consequently the number of turns being commensurate with the projectile power of the battery.

In describing the results of my experiments the terms *intensity* and *quantity* magnets were introduced to avoid circumlocution, and were intended to be used merely in a technical sense. By the *intensity* magnet I designated a piece of soft iron, so surrounded with wire that its magnetic power could be called into operation by an *intensity* battery, and by a *quantity* magnet, a piece of iron so surrounded by a number of separate coils that its magnetism could be fully developed by a *quantity* battery.

I was the first to point out this connexion of the two kinds of the battery with the two forms of the magnet in my paper in Silliman's Journal, January 1831, and clearly to state that when magnetism was to be developed by means of a compound battery, one long coil was to be employed, and when the maximum effect was to be produced by a single battery, a number of single strands were to be used.

These steps in the advance of electro-magnetism though small, were such as to interest and astonish the scientific world. With the same battery used by Mr. Sturgeon, at least a hundred times more magnetism was produced than could have been obtained by his experiment. The developments were considered at the time of much importance in a scientific point of view, and they subsequently furnished the means by which magneto-electricity, the phenomena of dia-magnetism, and the magnetic effects on polarized light were discovered. They gave rise to the various forms of electro-magnetic machines which have since exercised the ingenuity of inventors in every part of the world, and were of immediate applicability in the introduction of the magnet to telegraphic purposes. Neither the electro-magnet of Sturgeon nor any electro-magnet ever made previous to my investigations was applicable to transmitting power to a distance.

The principles I have developed were properly appreciated by the scientific mind of Dr. Gale, and applied by him to operate Mr. Morse's machine at a distance.

Previous to my investigations the means of developing magnetism in soft iron were imperfectly understood. The electro-magnet made by Sturgeon, and copied by Dana, of New York, was an imperfect quantity magnet, the feeble power of which was developed by a single battery. It was entirely inapplicable to a long circuit with an intensity battery, and no person possessing the requisite scientific know-

ledge would have attempted to use it in that connexion after reading my paper.

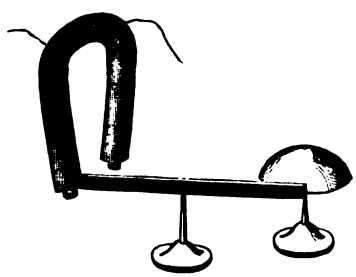
In sending a message to a distance two circuits are employed, the first a long circuit through which the electricity is sent to the distant station to bring into action the second, a short one, in which is the local battery and magnet for working the machine. In order to give projectile force sufficient to send the power to a distance, it is necessary to use an intensity battery in the long circuit, and in connexion with this, at the distant station, a magnet surrounded with many turns of one long wire must be employed to receive and multiply the effect of the current enfeebled by its transmission through the long conductor. In the local or short circuit either an intensity or a quantity magnet may be employed. If the first be used, then with it a compound battery will be required; and, therefore, on account of the increased resistance due to the greater quantity of acid, a less amount of work will be performed by a given amount of material; and, consequently, though this arrangement is practicable it is by no means economical. In my original paper I state that the advantages of a greater conducting power, from using several wires in the quantity magnet, may, in a less degree, be obtained by substituting for them one large wire; but in this case, on account of the greater obliquity of the spires and other causes, the magnetic effect would be less. In accordance with these principles, the receiving magnet, or that which is introduced into the long circuit, consists of a horse-shoe magnet surrounded with many hundred turns of a single long wire, and is operated with a battery of from 12 to 24 elements or more, while in the local circuit it is customary to employ a battery of one or two elements with a much thicker wire and fewer turns.

It will, I think, be evident to the impartial reader that these were improvements in the electro-magnet which first rendered it adequate to the transmission of mechanical power to a distance; and had I omitted all allusion to the telegraph in my paper, the conscientious historian of science would have awarded me some credit, however small might have been the advance which I made. Arago and Sturgeon, in the accounts of their experiments, make no mention of the telegraph, and yet their names always have been and will be associated with the invention. I briefly, however, called attention to the fact of the applicability of my experiments to the construction of the telegraph; but not being familiar with the history of the attempts made in regard to this invention, I called it "Barlow's project," while I ought to have stated that Mr. Barlow's investigation merely tended to disprove the possibility of a telegraph.

I did not refer exclusively to the needle telegraph when, in my paper, I stated that the *magnetic* action of a current from a trough is at least not sensibly diminished by passing through a long wire. This is evident from the fact that the immediate experiment from which this deduction was made was by means of an electro-magnet and not by means of a needle galvanometer.

At the conclusion of the series of experiments which I described in Silliman's Journal, there were two applications of the electro-magnet in my mind: one the production of a machine to be moved by electro-magnetism, and the other the transmission of or calling into action power at a distance. The first was carried into execution in the construction of the machine described in Silliman's Journal, vol. 20, 1831, and for the purpose of experimenting in regard to the second, I arranged around one of the upper rooms in the Albany Academy a wire of more than a mile in length, through which I was enabled to make signals by sounding a bell, (fig. 7.) The mechanical arrangement for affecting this object was simply a steel bar, permanently magnetized, of about ten inches in length, supported on a pivot and placed with its north end between the two arms of a horse-shoe magnet. When the latter was excited by the current, the end of the bar thus placed was attracted by one arm of the horse-shoe, and repelled by the other, and was thus caused to move in a horizontal plane and its further extremity to strike a bell suitably adjusted.

Fig. 7.



This arrangement is that which is alluded to in Professor Hall's letter* as having been exhibited to him in 1832 It was not, however, at that time connected with the long wire above mentioned, but with a shorter one put up around the room for exhibition.

At the time of giving my testimony, I was uncertain as to when I had first exhibited this contrivance, but have since definitely settled the fact by the testimony of Hall and others that it was before I left Albany, and abundant evidence can be brought to show that previous to my going to Princeton in November, 1832, my mind was much occupied with the subject of the telegraph, and that I introduced it in my course of instruction to the senior class in the Academy. I should

* See the Report of the Committee, page 96, and Proceedings of the Albany Institute, January, 1858.

state, however, that the arrangement that I have described was merely a temporary one, and that I had no idea at the time of abandoning my researches for the practical application of the telegraph. Indeed, my experiments on the transmission of power to a distance were superseded by the investigation of the remarkable phenomena, which I had discovered in the course of these experiments, of the induction of a current in a long wire on itself, and of which I made the first mention in a paper in Silliman's Journal in 1832, vol. 22.

I also devised a method of breaking a circuit, and thereby causing a large weight to fall. It was intended to illustrate the practicability of calling into action a great power at a distance capable of producing mechanical effects; but as a description of this was not printed, I do not place it in the same category with the experiments of which I published an account, or the facts which could be immediately deduced from my papers in Silliman's Journal.

From a careful investigation of the history of electro-magnetism in its connexion with the telegraph, the following facts may be established:

1. Previous to my investigations the means of developing magnetism in soft iron were imperfectly understood, and the electro-magnet which then existed was inapplicable to the transmission of power to a distance.

2. I was the first to prove by actual experiment that, in order to develop magnetic power at a distance, a galvanic battery of intensity must be employed to project the current through the long conductor, and that a magnet surrounded by many turns of one long wire must be used to receive this current.

3 I was the first actually to magnetize a piece of iron at a distance, and to call attention to the fact of the applicability of my experiments to the telegraph.

4. I was the first to actually sound a bell at a distance by means of the electro-magnet.

5. The principles I had developed were applied by Dr. Gale to render Morse's machine effective at a distance.

The results here given were among my earliest experiments; in a scientific point of view I considered them of much less importance than what I subsequently accomplished; and had I not been called upon to give my testimony in regard to them, I would have suffered them to remain without calling public attention to them, a part of the history of science to be judged of by scientific men who are the best qualified to pronounce upon their merits.

## DEPOSITION OF JOSEPH HENRY, IN THE CASE OF MORSE *vs.* O'REILLY,

TAKEN AT BOSTON, SEPTEMBER, 1849.

[*From the Record of the Supreme Court of the United States.*]

1. Please state your place of residence and your occupation ; also, what attention, if any, you have given to the subjects of electricity, magnetism, and electro-magnetism.

*Answer.*—I begin this deposition with the express statement that I do not voluntarily give my testimony; but that I appear on legal summons, and in submission to law. I am Secretary to the Smithsonian Institution, established in the city of Washington, where I now reside. The principal direction of the Institution is confided to me. As I do not expect to return to Washington until some time in October, I have been called upon to give my testimony here in Boston; on this account I labor under the disadvantage of being obliged to testify without my notes and papers, which are now in Washington.

I commenced the study of electro-magnetism in 1827 ; and since then have, at different times, [until] within the last two and a half years, when I became Secretary of the Smithsonian Institution, made original investigations in this and kindred branches of physical science. I know no person in our country who has paid more attention to the study of the principles of electro-magnetism than myself.

2. Please give a general account of the progress of the science of electro-magnetism, as connected with telegraphic communication ; and of any inventions or discoveries in electro-magnetism applicable to the telegraph, made by yourself.

*Answer.*—I consider an electro-magnetic telegraph as one which operates by the combined influence of electricity and magnetism. Prior to the winter of 1819–'20, no form of the electro-magnetic telegraph was possible; the scientific principles on which it is founded were then unknown. The first fact of electro-magnetism was discovered by Oersted, of Copenhagen, during that winter. It is this: A wire being placed close above, or below, and parallel to a magnetic needle, and a galvanic current being transmitted through the wire, the needle will tend to place itself at right angles to it. This fact was widely published, and the account was everywhere received with interest.

The second fact of importance was discovered independently, and about the same time, by Arago, at Paris, and Davy, at London. It is this: During the transmission of a galvanic current through a wire of copper, or any other metal, the wire exhibits magnetic properties, attracting iron, but not copper filings, and having the power of inducing permanent magnetism in steel needles. The next important fact was discovered by Ampère, of Paris, one of the most sagacious and successful cultivators of physical science in the present century. It is this: Two parallel wires through which galvanic currents are passing in the same direction, attract each other; but if the currents

pass in opposite directions, they repel each other. On this fact Ampère founded his ingenious theory of magnetism and electro-magnetism. According to this theory, all magnetic phenomena result from the attraction or repulsion of electric currents, supposed to exist in the iron at right angles to the length of the bar; and that all the phenomena of magnetism and electro-magnetism are thus referred to one principle, namely, the action of electrical currents on each other.

Ampère deduced from this theory many interesting results, which were afterwards verified by experiment. He also proposed to the French Academy a plan for the application of electro-magnetism to the transmission of intelligence to a distance; this consisted in deflecting a number of needles at the place of receiving intelligence, by galvanic currents transmitted through long wires. This transmission was to be effected by completing a galvanic circuit. When completed, the needle was deflected. When interrupted, it returned to its ordinary position, under the influence of the attraction of the earth. This project of Ampère was never reduced to practice. All these discoveries and results were prior to 1823.

The next investigations relating to the magnetic telegraph were published in 1825; they were by Mr. Barlow, of the Royal Military Academy of Woolwich, England. He found that there was great diminution in the power of the galvanic current to produce effects with an increase of distance; a diminution so great in a distance of two hundred feet was observed, as to convince him of the impracticability of the scheme of the electro-magnetic telegraph. His experiments led him to conclude that the power was inversely as the square root of the length of the wire. The publication of these results put at rest, for a time, all attempts to construct an electro-magnetic telegraph.

The next investigations, in the order of time, bearing on the telegraph, were made by Mr. Sturgeon, of England. He bent a piece of iron wire into the form of a horse-shoe, and put loosely around it a coil of copper wire, with wide intervals between the turns or spires to prevent them touching each other, and through this coil he transmitted a current of galvanism. The iron, under the influence of this current, became magnetic, and thus was produced the first electro-magnetic magnet, sometimes called simply the electro-magnet. An account of this experiment was first published in November, 1825, in the Transactions of the Society for the Encouragement of the Arts in England; and was made known in this country through the Annals of Philosophy for November, 1826.

Nothing further was done pertaining to the telegraph until my own researches in electro-magnetism, which were commenced in 1828, and continued in 1829, 1830, and subsequently; Barlow's results, as I before observed, had prevented all attempts to construct a magnetic telegraph on the plan of Ampère, and our own knowledge of the development of magnetism in soft iron, as left by Sturgeon, was not such as to be applicable to telegraphic purposes. The electro-magnet of Sturgeon could not be made to act by a current through a long wire, as will be apparent hereafter in this deposition.

After repeating the experiments of Oersted, Ampère, and others, and publishing an account in 1828 of various modifications of electro-

magnetic apparatus, I commenced in that year the investigation of the laws of the development of magnetism in soft iron, by means of the electrical current. The first idea that occurred to me in accordance with the theory of Ampère, with reference to increasing the power of the electro-magnet, was that of using a longer wire than had before been employed. A wire of sixty feet in length, covered with silk, was wound round a whole length of an iron bar, either straight or in the form of a U, so as to cover its whole length with several thicknesses of the wire.

The results of this arrangement were such as I had anticipated, and electro-magnets of this kind, exhibited to the Albany Institute in March, 1829, possessed magnetic power superior to that of any before known.

The idea afterwards occurred to me that the quantity of galvanism, supplied by a small galvanic battery, might be applied to develop a still greater amount of magnetic power in a large bar of iron. On experiment, I found this idea correct. A battery of two and a half square inches of zinc, developed magnetism in a large bar sufficient to lift fourteen pounds.

The next suggestion which occurred to me was that of using a number of wires of the same length around the same bar, so as to lessen the resistance which the galvanic current experienced in passing from the zinc to the copper through the coil. To bring this to the test of experiment, a second wire, equal in length to the first, was wound around the last mentioned magnet, and its ends soldered to the plates of the same battery.

The magnet with this additional wire lifted twenty-eight pounds, or, in other words, its power was doubled.

A series of experiments was afterwards made, to determine the resistance to conduction of wires of different lengths and diameters, and the proper lengths and number of wires for producing, with different kinds of galvanic batteries, the maximum of amount of magnetic development with a given quantity of zinc surface. For this purpose a bar of soft iron, two inches square and twenty inches long, weighing twenty-one pounds, and much larger than any before used, was bent in the form of a horse-shoe. Around this were wound nine strands of copper wire, each sixty feet long, the ends left projecting so that one or more coils could be used at once, either connected with a battery or with each other, thus forming several coils with several battery connexions, or one long coil with single battery connexions. The greatest effect obtained with this magnet, using a battery of a single pair, with a zinc plate of two-fifths of a square foot of surface, and all the wire arranged as separate coils, was to lift a weight of six hundred and fifty pounds; with a large battery the effect was increased to seven hundred and fifty pounds. In a subsequent series of experiments, not published with the preceding, the same magnet was made to sustain one thousand pounds. When a compound battery was employed of a number of pairs, it was found that the greatest effect was produced when all the wires were arranged as a single long coil. I subsequently constructed electro-magnets on the same plan, which supported much greater weights. One of these, now in the cabinet of Princeton, will sustain three thousand six hundred pounds with a

battery occupying about a cubic foot of space. It consists of thirty strands of wire, each about forty feet in length.

The abovementioned experiments exhibit the important fact that when a galvanic battery of intensity (that is to say, a battery consisting of a number of pairs) is employed, the electro-magnet connected with it must be wound with one long wire, in order to produce the greatest effect; and that when a battery of quantity, (that is, one of a single pair,) is employed, the proper form of the magnet connected with it is that in which several shorter wires are wound around the iron. The first of these magnets, which is the one now employed in the long or main circuit of the telegraph, may be called an intensity magnet; and the second, which is used in the local circuit, may be denominated the quantity.

The quantity of electricity which can be passed through a long circuit of ordinary-sized wire is, under the most favorable circumstances, exceedingly small, and in order that this may develop magnetism in a bar of iron, it was necessary that it should be made to revolve many times around the iron, that its effects may be multiplied; and this is effected by using a long single coil. Hence it will be seen that the electro-magnet of Mr. Sturgeon was not applicable to telegraphic purposes in a long circuit.

Previous to making the last experiments above mentioned, in order to guide myself, I instituted a series of preliminary experiments on the conduction of wires of different lengths and diameters, with different batteries. In these experiments a galvanometer, or an instrument consisting of a magnetic needle freely suspended within a coil of wire, was first employed to denote, by the deflection of its needle, the power of the current. The result from a number of experiments, with a battery of a single pair, was the same as that obtained by Barlow, namely, that the power diminished rapidly with the increase of distance. With the same battery, and a larger wire, the diminution was less. The galvanometer was next removed, and a small electro-magnet substituted in its place. With a single battery, the same result was again obtained—a great diminution of lifting power with the increase of distance. After this the battery of a single pair was removed and its place supplied by one of intensity, consisting of twenty-five pairs. With this the important fact was observed, that no perceptible diminution of the lifting power took place, when the current was transmitted through an intervening wire between the battery and the magnet of upwards of one thousand feet.

This was the first discovery of the fact that a galvanic current could be transmitted to a great distance with so little a diminution of force as to produce mechanical effects, and of the means by which the transmission could be accomplished. I saw that the electric telegraph was now practicable; and, in publishing my experiments and their results, I stated that the fact just mentioned was applicable to Barlow's project of such a telegraph. I had not the paper of Barlow before me, and erred in attributing to him a project of a telegraph, as he only disproved, as he thought, the practicability of one. But the intention of the statement was to show that I had established the fact that a mechanical effect could be produced by the galvanic current at

a great distance, operating upon a magnet or needle, and that the telegraph was therefore possible. In arriving at these results, and announcing their applicability to the telegraph, I had not in mind any particular form of telegraph, but referred only to the general fact that it was now demonstrated that a galvanic current could be transmitted to great distances with sufficient power to produce mechanical effects adequate to the desired object.

The investigations above mentioned were all devised and originated, and the experiments planned, by myself. In conducting the latter, however, I was assisted by Dr. Philip Ten Eyck, of Albany. An account of the whole was published in the 19th volume of Silliman's Journal, in 1831, with the exception of the account of the large magnet afterwards constructed at Princeton in 1833, and the experiment mentioned of lifting a thousand pounds with one of my first magnets. While I was engaged in these researches, Prof. Moll, of the University of Utrecht, was pursuing investigations somewhat similar, and succeeded in making powerful electro-magnets, but made no discovery as to the distinction between the two kinds of magnets, or the transmissibility of the galvanic current to a great distance with power to produce mechanical effects. In fact, his experiments were but a repetition on a large scale of those of Sturgeon.

After completing the investigations abovementioned, I commenced a series of experiments on another branch of electricity closely connected with this subject. Among other things, I applied the principles above mentioned to the construction of an electro-magnetic machine, which has since excited much attention in reference to the application of electro-magnetism as a motive power in the arts.

In 1832 I was called to the chair of natural philosophy in the College of New Jersey, at Princeton, and in my first course of lectures in that institution, in 1833, and in every subsequent year during my connexion with that institution, I mentioned the project of the electro-magnetic telegraph, and explained how the electro-magnet might be used to produce mechanical effects at a distance adequate to making signals of various kinds. I never myself attempted to reduce these principles to practice, or to apply any of my discoveries to processes in the arts. My whole attention, exclusive of my duties to the college, was devoted to original scientific investigations, and I left to others what I considered in a scientific view of subordinate importance the application of my discoveries to useful purposes in the arts. Besides this, I partook of the feeling common to men of science, which disinclines them to secure to themselves the advantages of their discoveries by a patent.

In February, 1837, I went to Europe; and early in April of that year Prof. Wheatstone, of London, in the course of a visit to him in King's College, London, with Prof. Bache, now of the Coast Survey, explained to us his plans of an electro-magnetic telegraph; and, among other things, exhibited to us his method of bringing into action a second galvanic circuit. This consisted in closing the second circuit by the deflection of a needle, so placed that the two ends projecting upwards, *of* the open circuit, would be united by the contact of the end of the needle when deflected, and on opening or breaking of the

circuit so closed by opening the first circuit, and thus interrupting the current, when the needle would resume its ordinary position under the influence of the magnetism of the earth. I informed him that I had devised another method of producing effects somewhat similar. This consisted in opening the circuit of my large quantity magnet at Princeton, when loaded with many hundred pounds weight, by attracting upward a small piece of moveable wire, with a small intensity magnet, connected with a long wire circuit. When the circuit of the large battery was thus broken by an action from a distance, the weights would fall, and great mechanical effect could thus be produced, such as the ringing of church bells at a distance of a hundred miles or more, an illustration which I had previously given to my class at Princeton. My impression is strong, that I had explained the precise process to my class before I went to Europe, but testifying now without the opportunity of reference to my notes, I cannot speak positively. I am, however, certain of having mentioned in my lectures every year previously, at Princeton, the project of ringing bells at a distance, by the use of the electro-magnet, and of having frequently illustrated the principle of transmitting power to a distance to my class, by causing in some cases a thousand pounds to fall on the floor, by merely lifting a piece of wire from two cups of mercury closing the circuit.

The object of Prof. Wheatstone, as I understood it, in bringing into action a second circuit, was to provide a remedy for the diminution of force in a long circuit. My object, in the process described by me, was to bring into operation a large quantity magnet, connected with a quantity battery in a local circuit, by means of a small intensity magnet, and an intensity battery at a distance.

The only other scientific facts of importance to the practical operation of the telegraph not already mentioned are the discovery by Steinheil, in 1837, in Germany, of the practicability of completing a galvanic circuit, by using the earth for completing the circuit, and the construction of the constant battery in 1836, or about that time, by Professor Daniell, of King's College, London. I believe that I was the first to repeat the experiments of Steinheil and Daniell in this country. I stretched a wire from my study to my laboratory, through a distance in the air of several hundred yards, and used the earth as a return conductor, with a very minute battery, the negative element of which was a common pin, such as is used in dress, and the positive element the point of a zinc wire immersed in a single drop of acid. With this arrangement, a needle was deflected in my laboratory before my class. I afterwards transmitted currents in various directions through the college grounds at Princeton. The exact date of these experiments I am unable to give without reference to my notes. They were previous, however, to the unsuccessful attempt of Mr. Morse to transmit currents of electricity through wires buried in the earth between Washington and Baltimore, and before he attempted to use the earth as a part of the circuit. Previous to this time, and after the abovementioned experiments, Mr. Morse visited me at Princeton, to consult me on the arrangement of his conductors. During this visit, we conversed freely on the subject of insulation and conduction of

wires. I urged him to put his wires on poles, and stated to him my experiments and their results.

In the course of the years 1836 and 1837, various plans of more or less merit, were devised, and more or less fully carried into effect, for applying the principles already discovered to the construction of electro-magnetic telegraphs in different parts of the world, but of these I do not undertake to give any particular account. I would say, however, that of these plans that for which Mr. Morse subsequently obtained a patent was, in my judgment, the best.

3. Please state whether or not you are acquainted with the electro-magnetic telegraph for which S. F. B. Morse obtained a patent in 1846. If you are, please state whether any, and if any, which of the principles or plans which you have described as discovered, or announced by yourself or others are used in the construction or operation of it. State also what principles used in the telegraph are, so far as you know, original with Professor Morse.

*Answer.*—I am acquainted with the principles and general mode of operation of the telegraph and improvement referred to. The telegraph is based upon the facts discovered by myself and others, of which I have already given an account.

The plan which was first described to me in the autumn of 1837 by Mr. Morse, or by Professor Gale, who was associated with him in the construction of the telegraph, was to employ a single entire circuit of wire, with an intensity battery to excite the current, and an intensity magnet to receive it and produce a mechanical action, which would work the recording apparatus. Mr. Morse afterwards employed the intensity battery in a long circuit, and an intensity magnet to receive its current at a distant point, and produce the mechanical effect of closing a secondary circuit. The secondary circuit may be either employed to transmit a second current to a distant point and there close a third circuit, and thus continue the line, or for working a recording apparatus in the secondary circuit, or it may be employed without reference to the continuation of the line, as a short local circuit to work a local magnet. In the first case, there must be in the secondary circuit an intensity battery and intensity magnet; in the last case, a quantity magnet and quantity battery are required.

I heard nothing of the secondary circuit as a part of Mr. Morse's plan until after his return from Europe, whither he went in 1838. It was not till long after this that Mr. Morse used the earth as a part of the circuit in accordance with the discovery of Steinheil.

I am not aware that Mr. Morse ever made a single original discovery, in electricity, magnetism, or electro-magnetism, applicable to the invention of the telegraph. I have always considered his merit to consist in combining and applying the discoveries of others in the invention of a particular instrument and process for telegraphic purposes. I have no means of determining how far this invention is original with himself, or how much is due to those associated with him.

4. Please state when you first became acquainted with Mr. Morse, and what knowledge he possessed of electricity, magnetism, and

electro-magnetism, and what information you or others communicated to him relating to the telegraph. State, also, all you know of the attempts of himself, and others associated with him, to construct an electro-magnetic telegraph, either from your own observation or from statements made by himself or by others in your presence. State particularly any conversation, if any, you may have had with him in reference to your own discoveries applied to the telegraph.

*Answer.*—Shortly after my return from Europe, in the autumn of 1837, I learned that Mr. Morse was about to petition Congress for assistance in constructing the electro-magnetic telegraph. Some of my friends in Princeton, knowing what I had done in developing the principles of the telegraph, urged me to make the representations to Congress, which I expressed some thought of doing, namely: that the principles of the electro-magnetic telegraph belonged to the science of the world, and that any appropriation which might be made by Congress should be a premium for the best plan, and the means of testing the same, which the ingenuity of the country might offer. Shortly after this I visited New York, and there accidentally made the personal acquaintance of Mr. Morse;* he appeared to be an unassuming and prepossessing gentleman, with very little knowledge of the general principles of electricity, magnetism, or electro-magnetism. He made no claims, in conversation with me to any scientific discovery, or to anything beyond his particular machine and process of applying known principles to telegraphic purposes. He explained to me his plan of a telegraph with which he had recently made a successful experiment; I thought this plan better than any with which I had been made acquainted in Europe; I became interested in him, and instead of interfering in his application to Congress, I [subsequently†] gave him a certificate, in the form of a letter, stating my confidence in the practicability of the electro-magnetic telegraph and my belief that the form proposed by himself was the best which had been published.

Mr. Morse subsequently visited Princeton several times to confer with me on the principles of electricity and magnetism which might be applicable to the telegraph. I freely gave him any information I possessed.

I learned in 1837, or thereabouts, that Professor Gale and Dr. Fisher were the scientific assistants of Mr. Morse in preparing the telegraph. Mr. Vail was also employed, but I know not in what capacity, and I am not personally acquainted with him. With Professor Gale I have been intimately acquainted for several years; he had been a pupil in chemistry of my friend Dr. Torrey, and had studied my papers on electro-magnetism, and, as he informed me, had applied them in the arrangement of the apparatus for the construction of Morse's telegraph.

My researches had been given to the world several years before the attempt was made to reduce the magnetic telegraph to practice. Mr.

* This meeting took place in the chemical store of Mr. Chilton, Broadway, New York, and the place and time are both indelibly impressed upon my mind.

† The word subsequently was accidentally omitted in giving my testimony. The omission, however, is of little importance.

Chilton, of New York, informed me that he had referred Mr. Morse to them previous to his experiments in the New York University. I was therefore much surprised on the publication, in 1845, of a work purporting to give a history of the telegraph, and of the principles on which it was founded, by Mr. Vail, then principal assistant of Mr. Morse, and one of the proprietors of his patent, to find all my published researches relating to the telegraph passed over with little more than the remark that Dr. Moll and myself had made large electro-magnetic magnets. Presuming that this publication was authorized by Mr. Morse and the proprietors of the telegraph, I complained to some of his friends of the injustice, and after his return from Europe, (for he was absent at the time the book was issued,) I received a letter, copied and signed by Mr. Vail, but written by Mr. Morse, as the latter afterwards informed me, excusing the publication, on the ground that he (Mr. Vail) was ignorant of what I had done, and asking me for an account of my researches. This letter was addressed to me after the book had been stereotyped and widely circulated. It has been translated into French, and, I believe, published in Paris. To the letter I did not think fit to make any reply. I afterwards received a letter from Mr. Morse, in his own name, on the same subject, to which I gave a verbal reply in January, 1847, in Washington. In this interview Mr. Morse acknowledged that injustice had been done me, but said that proper reparation would be made. Another issue of the same work was made, bearing date 1847, in which there is no change in the statement relative to my researches.

About the beginning of 1848 Mr. Walker, of the Coast Survey, in a report on the application of the telegraph to the determination of differences of longitude, alluded to my researches. A copy of this was sent to Mr. Morse, which led to an interview between Mr. Walker, Professor Gale, Mr. Morse, and myself. At this meeting, which took place at my office in Washington, Mr. Morse stated that he had not known until reading my paper in January, 1847, that I had two years before his first conception in 1832, settled the point of practicability of the telegraph, and shown how mechanical effects could be produced at a distance, both in the deflection of a needle and in the action of an electro-magnet; that he did not know, at the time of his experiments in 1837 that there had been any doubts of the action of a current at a distance, and that in the confidence of the persuasion that the effect could be produced, he had devised the proper apparatus by which his telegraph was put in operation. Professor Gale, being then referred to, stated that Mr. Morse had forgotten the precise state of the case; that he, (Mr. Morse,) previous to his, (Dr. Gale's,) connexion with him, had not succeeded in producing effects at a distance; that, when he was first called in he found Mr. Morse attempting to make an electro-magnet act through a circuit of a few yards of copper wire suspended around a room in the University of New York, and that he could not succeed in producing the desired effect even in *this* that circuit; that he (Dr. Gale) asked him if he had studied Prof. Henry's paper on the subject, and that the answer was "no;" that he then informed Mr. Morse that he would find the principles

necessary to success explained in that paper; that instead of the battery of a single element, he should employ one of a number of pairs; and that, in place of the magnet with a short single wire, he should use one with a long coil. Dr. Gale further stated that his apparatus was in the same building, and that having articles of the kind he had mentioned, he procured them, and that with these the action was produced through a circuit of half a mile of wire.* To this statement Mr. Morse made no reply. The interview then terminated, and I have since had no further communication with him on the subject.

5. Please state whether or not you ever constructed any machine for producing motion by magnetic attraction and repulsion; if yea, what was it, and what led to the making of it.

*Answer.*—After developing the great magnetic power of the electro-magnet as already described, the thought occurred to me that this power might be applied to give motion to a machine. The simplest arrangement which suggested itself to my mind was one already referred to, namely, causing a movable bar, supported on a horizontal axis like a scale beam, to be attracted and repelled by two permanent magnets. This could be readily effected by transmitting through a coil of wire around the suspended bar a current of galvanism, first in one direction, and then in the opposite direction, the alternations of the current being produced by dipping the ends of wires projecting from the coils into cups of mercury connected with batteries, one on either side. An account of this was published in Silliman's Journal, for 1831, vol. xx., p. 340. It was the first successful attempt to produce a mechanical motion which might apparently be employed in the arts as a motive power. This little machine attracted much attention at home and abroad, and various modifications of it were made by myself and others. I never, however, regarded it as practically applicable in the arts, because of the great expense of producing power by this means, except, perhaps, in particular cases where expense of power is of little consequence.

6. Please look at the drawings of the Columbian telegraph, now shown you, marked G. W. B. and N. B. C., and certified by G. S. Hillard, Commissioner. Describe generally the apparatus represented and its mode of operation, and state in what respects, if any, it differs from the telegraphic apparatus patented by Mr. Morse.

*Answer.*—I have looked at the drawings, and I find, on examination, that it will be impossible for me to give a definite answer to the question, unless I have more time than is now at my disposal, and the means of examining and comparing the operations of the machines.

7. Please state, if you can, how many original experiments you have made in the course of your investigations in electricity, magnetism, and electro-magnetism.

*Answer.*—The experiments I have mentioned in this deposition form but a small part of my original investigations. Besides many

* See Dr. ale's letter of April 7, 1856, page 93.

that I made in Albany, which I have not mentioned, since my removal to Princeton, I have made several thousands on electricity, magnetism, and electro-magnetism, particularly the former, which have more or less bearing on practical applications of this branch of science, brief minutes of which fill several hundred folio pages. Many of these have not been published in detail. They have cost me years of labor and much expense.

The only reward I ever expected was the consciousness of advancing science, the pleasure of discovering new truths, and the scientific reputation to which these labors would entitle me.

JOSEPH HENRY.

Sworn to before me, September 7, 1849.

GEO. S. HILLARD,
*Commissioner.*

## GENERAL APPENDIX TO THE REPORT FOR 1857.

The object of this Appendix is to illustrate the operations of the Institution by the reports of lectures and extracts from correspondence, as well as to furnish information of a character suited especially to the meteorological observers and other persons interested in the promotion of knowledge.

# LECTURES ON COAL.

BY PROFESSOR JOSEPH LE CONTE.

re is a book in which are revealed the divine character and
Science is the human interpretation of this divine book, hu-
tempts to understand the thoughts and plans of Deity. The
eing divine, it is evident that all parts are equally sacred.
ojects of all sciences may be said to be equally, because they
infinitely, noble. To the scientific mind the organization of an
a polyp, or an infusorial animalcule is no less dignified a sub-
uman inquiry than the organization of the solar system. Yet,
e Sacred Scriptures, while all parts are equally sacred, because
divine, some are cherished with peculiar reverence, as giving
conceptions of divine character, or clearer views of human duty.
in science there are some branches which, by a certain magni-
the objects with which they deal, strike the imagination and
the enthusiasm in a peculiar degree. From a purely abstract
lectual point of view they may be all equal, but as human stu-
means of elevating the mind and ennobling the soul, they
ery much among themselves.
is, the noblest function of science, there are two departments
stand out beyond all others, viz: astronomy and geology. We
accustomed to look upon astronomy as the most magnificent of
s, as more than all others extending the bounds of human
tual vision; but I am perfectly confident that when the age
asped as firmly and apprehended as clearly the fundamental
geology as it has already done that of astronomy, all will
ith me in thinking that the former is not one whit behind the
n the overwhelming grandeur of its conceptions. Let us, then,
e these two noble sciences. Let us attempt to vindicate the
of geology to stand beside astronomy in the very first rank of
s as twin sisters, distinguished from all others by superior
and dignity.
e are two conditions of material existence, viz: *space* and *time*.
not conceive of material existence except under these two con-
. Now, the peculiar province of astronomy is space, as that of
is time. Other sciences may have to do with space, limited
a portion of space, but it belongs to astronomy alone to deal
finite space. So also there are other sciences which necessarily
th limited time, but it is the peculiar prerogative of geology to
th infinite time.* As astromy is *limited* in *time* to the present
or, in fact, to about two thousand years, but unlimited in space,
geology is *limited in space* to the surface of the earth, but *un-*
*in time*. As astronomy measures her distances by billions of

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se the term "*infinite*" with reference to time, as with reference to space, as synony-
h *inconceivably great*, illimitable by human conception.

miles, or millions of earth radii, so geology her epochs by millions of years, *i. e.*, earth revolutions. As the astronomer takes the radius of the earth as a *base line* wherewith to measure the dimensions of the solar system, so the geologist takes the present geological epoch, and "causes now in operation," as a *time measuring rod*, with which to estimate the length of the tertiary period. As the astronomer, becoming more bold as he ascends, takes the diameter of the earth's orbit as a line wherewith to calculate the distances of the fixed stars, or even dares to estimate the probable distance of the remotest nebula, so the geologist, no less daring, takes the tertiary as a rod wherewith to measure approximatively the almost inconceivable lapse of time represented by the secondary rocks, or even dares to cast his telescopic glance back into the dim nebulosity of the remotest palæozoic period. Finally, as the astronomer, when telescopic vision fails, still speculates, though filled with awe, concerning the infinite, unknown abyss of space beyond, so also the geologist, when mile-stones are no longer visible, when fossils and stratified rocks fail, still vainly peers with wondering gaze backward, and strives to pierce the darkness beyond, still believes that all he sees, or can ever hope to see, is but a fragment of the infinite abyss of time beyond. Overwhelmed, appalled, he shrinks back within himself, and remembers that his own mind, so daring, so arrogant, so apparently limitless, is also but a fragment of the infinite intelligence.

Thus, while astronomy fills the regions of the *universe* with objects, geology fills the regions of *infinite duration* with events. As astronomy carries us upwards by the relations of geometry, geology carries us backwards by the relations of cause and effect. As astronomy steps from point to point of the universe by a chain of triangles, so geology steps from epoch to epoch of the earth's history by a chain of mechanical and organical laws. If one depend on the axioms of geometry, the other depends upon the axioms of causation. In a word, the realm of astronomy is the universe of space, that of geology the universe of time. The one peoples her universe with *space-worlds*, the other her's with creations—*time-worlds*.

The great object of all science is to establish the universality of law; harmony in the midst of apparent confusion; unity in the midst of diversity; unity of force amidst diversity of phenomena, physical science; unity of plan in the midst of diversity of expression, natural science. Now, it is the peculiar province of astronomy to establish this universality of law throughout all space, as it is of geology throughout all time. Astronomy shows that the same force which controls the falling of a stone governs the motions of the heavenly bodies; so also geology shows that the changes through which each animal passes in its embryonic development are similar to those through which the whole earth and its inhabitants have passed in the course of its geological history; that the same mind which now conducts the one has presided through all time over the other. If astronomy, more than all other sciences, illustrates that sublime attribute of Deity, His omnipresence or unchangeableness in space, geology, more than all other sciences, illustrates that other sublime attribute of Deity, His immutability or unchangeableness in time.

There are in the history of science two eras which, more than all others, strike the imagination and fill the mind with admiration. Or rather, I should say, two moments, the greatest in the intellectual history of the human race. They are those in which were born in the mind of man the fundamental ideas of astronomy and geology—the ideas of infinite space and infinite time, containing other worlds and other creations. You have all, probably, thought of the sublimity of that moment when the idea of infinite space, peopled with worlds like our own, was first thoroughly realized by the mind of man. You have all, probably, shared in imagination the exstacy of Galileo as gazing with awe through the first telescope, the phases of Venus and the satellites of Jupiter suddenly revealed to him the existence of other worlds besides his own. Before that pregnant moment our own was *alone* in the universe. Sun, moon, and stars were but satellites to the earth. Astronomy was but the geometry of the heavens; the geometry of the curious lines which these "*wandering fires*" traced upon the crystalline concave of the skies. In an instant the great fundamental idea of modern astronomy was born in the mind of Galileo. In an instant man's intellectual vision is infinitely extended, but his own world, before so great, has shrunk into an atom in the midst of infinite space; has become a younger sister, a comparatively insignificant member in a great family of worlds.

We have all been accustomed to look upon this as the grandest moment in the intellectual history of man. But there is another moment less known, or if known, less thought of, because less understood and less appreciated, but not less grand. It is that in which was born in the mind of man the fundamental idea of geology; in which the idea of other time-worlds besides our own entered the mind of the aged Buffon.

For many years, indeed centuries, it had been observed that organic remains, particularly marine shells, might be found far inland, and even high up the slopes of mountains. There was much speculation among scientific men as to the origin of these shells. They were attributed by some to the deluge, by others more truly to gradual and permanent changes in the relative level of sea and land. But no one for a moment supposed that they belonged to any period anterior to the present epoch. Some may have supposed that they were extending the known limits of the present epoch, that they were discovering new *continents* in the *ocean* of time, but never dreamed that these were the evidences of a *new world* in the *infinite abyss* of time. Buffon himself had taken active part in these discussions. Finally, near the end of the last century, and in the evening of his great and long life, a large number of these remains, both marine shells and mammalian vertebrates, larger than he had ever examined before, were placed at his disposal and subject to his inspection. To his astonishment he found them entirely different from species now inhabiting the earth. In that moment, in the mind of the venerable Buffon, suddenly, like Minerva from the head of Jove, was born the idea of infinite time containing successive creations. In an instant man's intellectual vision was again infinitely extended; but his own world again dwindled into a single day in the geological history of the earth.

worlds and their races. She teaches unmistakeably that there has been a gradual course of preparation for the present epoch; that there is an unity of plan in the whole system of time-worlds; that, in a certain sense, they are all satellites to *ours;* that they are all bound together by a force; that force the plans of the Almighty, and its centre the present epoch. Thus man becomes the centre of the universe of time. Thus, also, by analogy we are led to suspect that there may be a similar unity in the system of space-worlds also, and that ours may, and probably does, enjoy a superiority, if not in size at least in organization, and therefore in the intelligence of its inhabitants. Thus man's dignity is restored, or rather, I should say, dignity is given in place of pride. "Pride goeth before a fall," but dignity comes after.

But it will no doubt be objected by many that the position of a science depends not only upon the dignity of its subjects, but also, in no small degree, upon the certainty of its conclusions, and that, in this respect, astronomy is far superior. But even this is a mistake, the result of misconception. Even here the superiority of astronomy has been very much exaggerated. Astronomy has its hypotheses and uncertainties as well as geology; and, on the other hand, geology has its certainties as well as astronomy; only it has happened, in this as well as in many other cases, that the wisdom of age has given false dignity to its errors and follies, while the wildness of youth has discredited its wisdom. The certainties of astronomy have given an appearance of truth to its wildest hypotheses, while the hypotheses of geology have unjustly thrown some discredit upon her truest theories and most certain facts. The certainties of astronomy are the form, size, weight, distance, and relative position of her space-worlds. Her uncertainties are their physical geography, climate, and, more than all, their inhabitants, animal and vegetable. The certainties of geology are the physical geography, climate, and, more than all, the inhabitants, animal and vegetable, of her time-worlds, while her uncertainties are their relative size and distance. It is seen, then, that the certainties of the one are precisely the uncertainties of the other. Which, then, are the nobler—the certainties of astronomy or those of geology? Is it more noble to know the relative size and position of worlds in space and time or to be acquainted with the beings which form their crowning glory? It would carry me too far to pursue this train of thought. Suffice it to say that, in either case, that which was most important to know has been rendered most certain; while, also, in both cases, that which is most uncertain is also least important to know.

I have thought this long introduction necessary, because geology is so constantly misunderstood. She is looked upon by some with suspicion, as wild in her speculations and uncertain in her conclusions; by others with indifference, as a mass of dry and unattractive detail; and by still others with positive dread, as tending to infidelity. I deemed it necessary, therefore, to say a few words in vindication of her high rank among the inductive sciences, both in respect to the certainty of her conclusions, and, still more, the nobleness of her conceptions and the absorbing interest of her subjects. I might have

gone still further, and vindicated her claim to be considered the chief handmaid of religion among the sciences. But this would have led me much too far. Thirty years later, and all I have thus far said would have been unnecessary. One generation more and geology will need no defender; both her dignity and her religious tendency will be universally acknowledged. But for this purpose one more generation must first pass away.

Perhaps it may seem to some of you as a startling paradox, but it is nevertheless a fact, that the shortness of human life is one of the most powerful elements of human progress. It would seem as if the human mind grows and develops, the philosophy and opinions which govern the conduct of life continue to be modified and moulded, until about the age of twenty-five or thirty, when the character becomes unchangeable, opinions become prejudices, and the whole mind, as it were, petrified. Further progress would be impossible, but that another generation, with minds still plastic, comes forward, takes up and carries on the work a few steps, and becomes petrified in its turn. There are certainly some noble exceptions to this rule—instances of minds which with their maturity retain the plasticity of youth—but the very rarity of the exception only proves the rule.

You doubtless recollect that the children of Israel wandered forty years in the wilderness before they were fit to enter the promised land. The marks of Egyptian bondage were upon their souls as well as upon their necks. One generation must fall in the wilderness, and a new generation, free from Egyptian prejudices, must arise. We are apt to look upon this as an isolated fact in history, and entirely characteristic of this peculiar people. On the contrary, it is a fact of deepest significance in the philosophy of human progress, and intended for the instruction of us all. To this day it seems to be impossible that any great step should be made in the intellectual progress of our race, except by the sacrifice of at least one generation. We are even now in the midst of such a great change, brought about by the revelations of geology. One more generation dropped in the wilderness and we are fairly in the promised land. Do not misunderstand me, however, as quarrelling with this *conservative spirit;* on the contrary, this brake upon the wheels of the car of progress seems absolutely necessary for its steady motion.

But I find I am again digressing, and therefore hasten to return to my subject.

I have said that the field of geology is the universe of time. It is one of these time-worlds of which I wish to draw a true, though necessarily an outline, picture in the next two or three lectures. I shall not attempt more than an outline, for this would only tire you with a multitude of details, but shall seize, if possible, the most striking features, make a comparison between this and other subsequent time-worlds, particularly our own, and endeavor to find the law which binds the whole into one system.

Among the many time-worlds of which geology tells us I select but one, viz: the COAL PERIOD. Its position is far back in the palæozoic times. Measuring time by space it is in the region of the fixed stars, although one of the brightest in the firmament of time. If I could

transport you in imagination to the surface of Sirius; if I could draw a picture of its physical geography, climate, and, more than all, of its inhabitants, who in this audience would remain unmoved? Shall the interest be less because the separation from us is by time instead of space; because the place is our own earth, and the materials of the picture beneath our very feet?

The coal period is a world distinctly separated from those which precede and those which follow it. As in the geographical distribution of fauna and flora upon the surface of the earth at the present time, we find in some cases contiguous fauna and flora seem to interpenetrate or pass by insensible gradations into one another; the species on the confines of each dying out in number but not in specific character, insensibly *replaced* but not *transmuted.* So also in the distribution of fauna and flora in time we find some (as, for instance, those of the tertiary) which pass by insensible gradations into one another, or interlock with the preceding and succeeding, although only by gradual replacement, not by transmutation. But as in geographical distribution we also find many fauna and flora completely isolated by physical barriers, mountain chains, oceans, or deserts, from contiguous fauna and flora, so also in geological distribution we find creations are often distinctly separated from other creations contiguous in time, by physical barriers in the form of convulsions of the earth, and marked by broken, dislocated, and upturned strata. In the history of the earth there seems to have been many such successive creations completely destroyed by convulsions; in other words, the time-worlds are apparently separated by blank spaces, whose dimensions we have no means of estimating. Such a distinct world is the coal period, with its fauna and flora distinctly separated from the old red sandstone which precedes, and still more so from the new red sandstone which succeeds. A *distinct world*—completely circumscribed in time—having its own poles and equator.

Now, in geology, history is recorded upon *tablets of stone*—stratified rocks. Time is represented by their thickness; remarkable events by their dislocation; the fauna and flora by the contained fossils. Let us, then, examine the strata which represent this period.

They are called the "carboniferous strata," and the period the "carboniferous period," from the remarkable fact that they contain almost all the coal which is found in the world. The deposit of carbonaceous matter is not indeed confined to this period, for it has occurred in every period of the earth's history, as evidenced by the fact that thin seams of coal are found in all the strata. Similar deposits are still going on in peat bogs and deltas of the present day. But the accumulations of carbon in the strata of which we are speaking are so enormous, in comparison to those found elsewhere, that the name carboniferous, as applied to these strata and this period, becomes entirely appropriate. With the single exception of the oolite strata, which belong to the secondary period, and in which coal is profitably mined in Virginia and in England, all known coal mines belong to the carboniferous strata. The knowledge of this simple fact would have saved the useless expenditure of millions of dollars, both in this country and in England. It is worse than useless to expend money and labor in

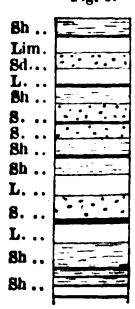
following up signs of coal, unless we are sure we are in the region of the carboniferous strata.

The carboniferous strata are subdivided into two very distinct groups, representing, of course, distinct subdivisions of the carboniferous period. These are called lower and upper carboniferous, or the mountain limestone, and the "coal measures." The former are mostly limestone, the latter mostly shales and sandstone; the one mostly of marine origin, the other mostly fresh water; the fossils of the one are mostly marine animals, of the other terrestrial vegetation. I shall confine myself entirely to the latter, or the true "*coal measures*," as they are called, from the fact that ninety-nine hundredths of all the coal in the world are found in them.

You will observe, then, that I have taken for my subject one-half of the carboniferous period. The carboniferous is itself but one of the four great subdivisions of the palæzoic period, and the palæzoic period, in its turn, only one of the four great epochs, exclusive of the present, into which the history of our earth is divided. You see, then, that the period of which I wish to give you a rapid sketch is less than one-thirtieth part of the *recorded* history of the earth; yet the average thickness of these strata is about 3,000 or 4,000 feet. In Wales they are 12,000 feet thick, and in Nova Scotia nearly 15,000. If, then, thickness of strata represent length of time, how great must be the lapse of time represented by the coal measures.

Such being the enormous thickness of the *coal measures*, it necessarily follows that but a very small proportion of the mass consists of coal. The coal strata consist of thick beds of limestone, sandstone, ironstone, and shale, containing thin seams of *coal*, and this alternation sometimes many times repeated in the same locality; the whole forming a series like the sheets of a ream of paper, arranged in no discoverable rational order, but indiscriminately alternating. The seam of coal will sometimes be covered with a stratum of limestone, sometimes of standstone, and sometimes of shale; although it rarely happens that the sandstone or limestone comes directly in contact with the coal; but is generally separated by a stratum, sometimes very thin, of shale or slate. In fact a stratum of clay or fine mud rock both underlies and overlies each seam. Below it forms the "fire clay," and above the black slate of the miners.

Fig. 1.




I have said that the order is various in different parts of the same alternating series; but in every part of the same coal field the alternation is the same for the same part of the series. In other words, each stratum is generally horizontally extended over the whole coal field in a continuous sheet, so that each seam is accompanied by the same strata above and below. This is a fact of great importance, as it affords the readiest means of determining the identity of individual coal seams.

Coal strata, like all other sedimentary deposits, were at the time of formation horizontal, or nearly so. Sometimes they are found nearly in this their original position, as in many of the coal fields of our own country. More generally this original horizontality has been disturbed by igneous agency, and the

coal strata are found in the form of basins. Sometimes the strata are so folded as to give rise to series of basins belonging to the same

Fig. 2.

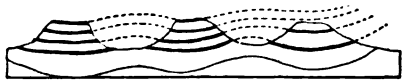
Fig. 3.

original field. Whether, however, the strata retain their original horizontality, or are thrown into basins by igneous agency, seldom or never do we find the whole of the original mass deposited. A large portion has been carried away by aqueous agency. From this cause a large coal field, covering many thousands of square miles, may exist only in the form of isolated mountains or detached basins of coal strata, as in the accompanying figures, where all the mass represented

Fig. 4.

Fig. 5.

Fig. 6.



by the dotted lines has been carried away by denuding agencies. Thus, for instance, nearly the whole of Illinois was originally occupied by a vast coal field, but little disturbed by igneous agency, but by far the larger portion of the coal strata of this immense field was carried away by denuding agencies.

You will observe, then, the striking difference in mode of occurrence between metallic ores and coal. The former are associated with rocks of every age, except, perhaps, the tertiary; the latter almost exclusively confined to those of a particular age. The former exist in the form of veins intersecting the strata, the latter in the form of seams parallel with the strata. The former extend indefinitely downwards, the latter horizontally. The former are the result of igneous agency, the latter of sedimentary deposit. Ignorance of this simple but radical difference has been the cause of much pecuniary loss, and seems not yet entirely eradicated. When, for instance, some years ago it was rumored in the streets of Philadelphia that the bottom of the Mauch Chunk Summit mine was reached, there was an universal panic, and stocks in coal mines went down enormously, not knowing that the continuation of coal seams was to be looked for horizontally rather than vertically.

This simple rule, when taken in connexion with the one previously enunciated, viz: that a coal seam throughout its whole extent is attended both above and below by the same strata, would render the identification of coal seams, and the tracing of them across valleys from hillside to hillside, a matter of little difficulty, were it not for

dislocation of the strata, producing what are called faults, slips, or troubles. In the accompanying figures, for instance, the strata have

Fig. 7.

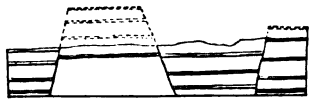
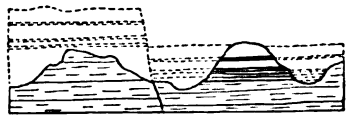


Fig. 8.



been displaced by the elevation of one part of the field more than another. This is not conspicuous on the surface, because all has been cut down to one level by aqueous agencies. The supposed configuration of surface immediately after such unequal elevation is represented by the dotted outline; the strong line represents the present configuration of surface. All between these, therefore, represents the amount of matter carried away by denuding agencies. These faults occur very often in coal fields, and are a source of serious annoyance to the miner.

I have taken here the simplest case of dislocation. The difficulty becomes very much greater when, instead of being horizontal, the strata are highly and variously inclined. In such cases the skill and knowledge of the geologist is often tasked to the utmost.

I have said that while metallic veins extend indefinitely downwards, coal seams for the most part are extended horizontally, or nearly so. Sometimes, however, coal seams may appear, like metallic veins, to extend downwards. This is the case in highly inclined and particularly in vertical strata, as in the accompanying sketch of the anthracite coal field of Pennsylvania. In such cases, however, as well as in

Fig. 9.

every other, it will be observed that the seams are strictly parallel with the strata, that the strata have been elevated to a vertical position by igneous agency, and the included coal seams have been raised with them, still maintaining their relative position.

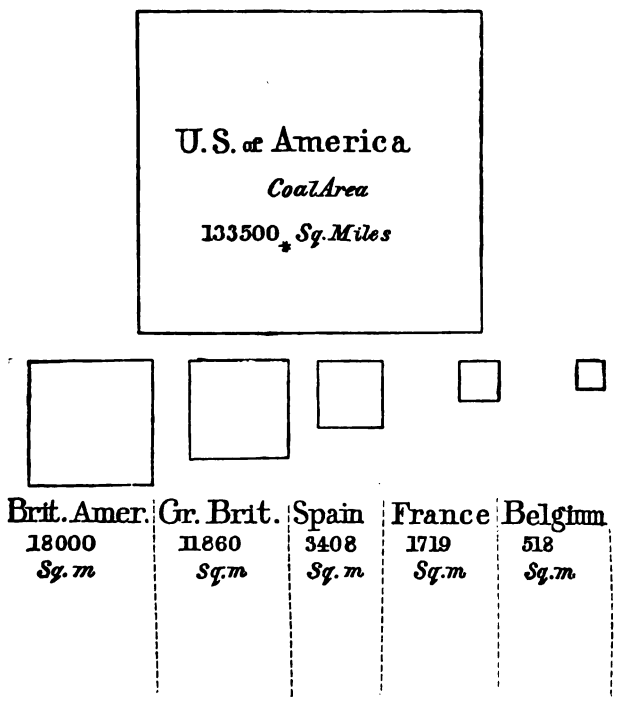
The *thickness* of coal seams varies from a few lines to many feet; sometimes they exist as sheets as thin as paper, in others in masses 30 or 40 feet thick. A single seam of pure coal, however, is seldom more than 6 or 8 feet thick. It is true that in France and in the anthracite region of Pennsylvania they are said to occur 60 or 70 feet thick, or even more, but upon close examination such mammoth seams will be found to consist of two or more seams, separated by thin laminæ of slate; too thin, however, to form a roof, and, therefore, the several seams are wrought together as one.

The *number* of seams occurring in one locality and separated by interstratified sandstone and shale is sometimes as great as one hundred, and their aggregate thickness one hundred and fifty feet. Enormous as is this mass of carbonaceous matter, it is but a small fraction of the entire mass of the coal strata. The thickest and purest

ms are generally near the middle of this series; as if the conditions essary for the formation of coal had gradually come into existence l as gradually disappeared; that there were two poles and an ıator belonging to this time-world—a morn, noon, and evening to ɜ geological day.

Ve have spoken thus far only of the thickness of coal strata and of l seams; but it is impossible to form a correct idea of the amount natter contained in these strata or in these seams without taking ɔ account also their horizontal extent. Coal is very widely dis- ɔuted over the world, although some countries are more favored n others. England, France, Spain, Portugal, Belgium, Sweden, and, and Russia have their beds of coal. It is also found abun- ıtly in Asia, Africa, and South America; but no where is the coal nation more extensively displayed than in the United States, and where are its beds of greater thickness, more convenient for work-, or of more valuable quality. There are within the limits of the ited States no less than four coal fields of enormous dimensions. ɜ of these, the Appalachian coal field, commences on the north, in ınsylvania and Ohio, sweeping south through western Virginia

Fig. 10.




l eastern Kentucky, Tennessee, extends even into Alabama. Its a is estimated at about 60,000 square miles. A second occupies greater portion of Illinois and Indiana; in extent almost equal to

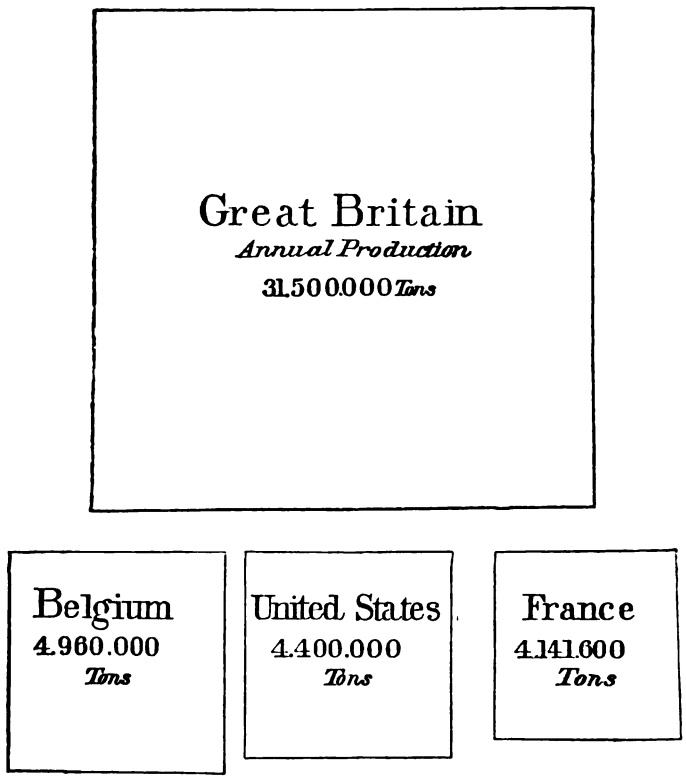
Recent estimates by Marcou and by H. D. Rodgers make the coal area of the United ɜ near 200,000 square miles.

the Appalachian. A third covers the greater portion of Missouri, w
a fourth occupies the greater portion of Michigan. Just out of
limits of the United States, in New Brunswick and Nova Scotia, t
is still a fifth, occupying, according to Mr. Lyell, an area of 36
square miles. Besides these there are several others of lese exten

If we now compare the relative coal areas of the principal coal
ducing countries, the superiority of our own will be still conspicu
The following diagrams represent these relative areas in a more
telligible form than could be done by mere figures.

But if, on the other hand, we compare in the same manner
relative annual production of the same countries, we will find
order very different.

Fig. 11.




It will be seen that the annual production of coal in Great Bri
is more than seven times that of the United States, although her
area is so much less. It is estimated that even at this enormous
of production the coal fields of Great Britain will yet last for
years. There is little danger, then, that ours will fail us shortly.

Now industry, as the basis of the organization of society, forms
distinguishing feature of modern civilization. Coal is the very alin
of industry. The material prosperity of any country may there
be tolerably accurately estimated by the amount of coal consun

ccording to this method of estimation, Great Britain is superior to l other countries in actual material civilization. But if the conmption of coal is a measure of the *actual* civilization of a country, e *amount of coal area* represents its *potential* civilization. How far e we superior to all other countries in this respect! What a glorious estiny awaits us in the future—a destiny already predetermined in e earliest geological history of the earth.

One more remark and I am done. It is certain that, as manucturing and productive industry take root and flourish almost exusively in cool and temperate climates, so also in them do the coal rmations prevail in the greatest abundance. Our scientific maps nd investigations confirm the one, and national statistics the other. lmost all the true coal of the world is found in the north temperate one. Thus the climates which are most congenial to laborious occuations, the latitudes best adapted to the vigorous growth of industrial vilization, are precisely those where, fortunately, have been placed e materials of labor, the aliment of industry. Fortunately did I ay? No; this has not been the result of blind chance, but of eliberate providential design. We have here a sublime illustration f that all-comprehensive foreknowledge which foresees and designs he end from the beginning; of that immutability which changes not, ut only unfolds its eternal plans; of that unity in the system of ime-worlds of which I have already spoken, our own epoch being the un and centre.

### THEORIES OF THE COAL.

There is no point connected with the coal which has been the subject of so much discussion as the manner of its accumulation. At first view, existing nature seems to offer no analogy to guide us in our attempts to account for such enormous accumulations of carbonaceous matter. It is admitted, however, I believe, on all hands, that the deposit must have taken place in water. The perfect preservation of the carbon of the plants, and often of their external forms and structure, which must have suffered complete oxydation and disintegration if exposed to the air, the fact that the plants were most or all of them swamp plants, and, more than all, the alternation of coal seams with sedimentary deposits of clay and sand, all seem to point unmistakably to water as the preserving agent. There is still another evidence which I think has generally been overlooked. In the midst of the more structureless bituminous matter of the coal are often found imbedded wedge-shaped masses of vascular tissue called native carbon. No one who attentively examines these wedges can fail to perceive that they are the wooden wedges of exogens separated by the decomposition of the softer cellular tissue of the intervening medullary rays, while they floated as logs upon the water and finally became imbedded in the carbonaceous mud below.

Thus far I believe all theorists agree. But from this point opinions diverge; some geologists holding that the coal was deposited on the spot where the plants grew, others that the plants were drifted in the

form of rafts to great distances and deposited at the mouths of rivers; the former, that a coal basin is the site of an ancient peat bog, the latter, that it is the position of an ancient estuary or delta. The former opinion is called the "*peat bog theory*," the latter the "*estuary theory*."

*Peat bog theory.*—It is well known that in many countries, particularly in moist, cool climates, and damp, low grounds, certain plants, such as ferns, mosses, &c., as well as trees which delight in moist places, if allowed to grow undisturbed from generation to generation will, by their decay, accumulate enormous masses of carbonaceous matter. Such a spot is called a *peat bog*. The theory of this accumulation is as follows: Plants derive all their carbon from the atmosphere. In the annual fall of leaf, and finally their own death, they return to the earth the whole of the matter thus silently extracted from the air. Undisturbed vegetation, therefore, constantly enriches the soil by adding to it what has been taken from the air. Thus worn out lands improve by lying fallow. Thus the rich black vegetable mould found covering the ground in forests continues to increase from year to year. In all ordinary cases, however, there is a limit beyond which this accumulation will not go. By decomposition the organic matter is again returned to the atmosphere as fast as it accumulates. But if by any means this decomposition is prevented the organic matter accumulates indefinitely. This is precisely what takes place in peat bogs. The presence of water in a great measure prevents the oxydation of the carbon. The growth of plants now continually takes carbon from the atmosphere, their death as continually deposits it upon the earth. Each generation rises, phœnix-like, from the ashes of the last, to become in its turn soil for the next. Thus the ancestral accumulation continues to increase, the funeral pile continues to rise, until pure carbonaceous matter may in time accumulate to the depth of thirty or forty feet. Such a mass of carbonaceous matter deprived of its water and compressed to the density of coal, would make a seam of perhaps three or four feet in thickness. Now, according to the peat bog theory, it is under such circumstances that the carbon of a coal seam has been accumulated.

The arguments in favor of this theory are: 1st. *The purity of the coal.* It is true that coal is often found largely mixed with earthy matter or mud. As we have already shown, every stage of gradation may be traced between pure coal and pure shale. But by far the larger portion of coal seems to be entirely free from foreign matter. The amount of ash is not greater than five to ten per cent.; that is, not greater than might arise from the earthy matter of the plants from which the coal was derived. This purity of the coal indicates complete absence of sediment in the water in which the coal was originally laid down. Now the water of peat swamps, though discolored by organic matter in solution, is always entirely free from sediment. In fact, this seems a necessary condition of the growth of peat plants—an incursion of water containing mud is fatal to such plants. If, then, a coal seam is the result of carbonaceous matter

slowly accumulated at the bottom of ancient peat swamps, the purity of the coal is completely accounted for. But if, on the contrary, it is formed by the accumulation of timber carried down to the mouths of great rivers during freshets, it should always be largely mixed with mud.

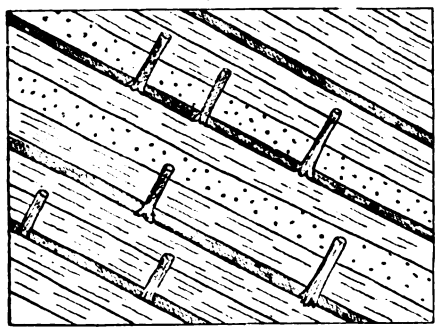
2d. The fine preservation of the tenderest and most delicate parts of plants. We have already spoken of the profusion of finely-preserved leaves and entire fronds of ferns in the black slate overlying a coal seam. So perfect is this preservation that large and complex fronds are often entirely unbroken, and even the minutest variation of the leaves as distinct as in the living fern. This fine preservation of tender parts seems strongly to indicate that these leaves had fallen gently from the parent stem, and been preserved on the spot where they fell. It seems utterly inconsistent with the violent action of currents bearing rafts to great distances.

3d. The position of the finely-preserved leaves, &c., always on the upper surface of the coal seam, (roof of the coal mine.) Precisely the same is observed in every peat swamp. The perfect leaves are to be found only on top, for the plain reason that these are the last fallen, and therefore not yet disorganized. But in the case of accumulations of vegetable matter at the mouths of rivers, there seems to be no reason why leaves should not be entangled in all parts alike.

4th. Coal, like peat, is composed of completely disorganized carbonaceous matter, containing fragments in which vegetable structure is more distinct. This is not inconsistent with what I have already said in my last lecture of the vegetable origin of even the most structureless coal being detectable by the microscope. Plants are composed entirely of cells. Both in peat and in coal these cells are generally separated from one another. The vegetable structure is completely disorganized, but the separate cells still bear unmistakable marks of their origin; the organic structure is gone, but the organic origin is still visible. But if a coal seam was an imbedded raft, it should be composed almost entirely of fragments of trunks, branches, &c., instead of a structureless mass containing only a few such fragments.

5th. It will be recollected that a seam of coal is overlaid by black slate and underlaid by fire-clay. In the black slate, as already said, are found the finest impressions of leaves and other tender parts; *in the fire-clay*, which underlies the coal seam, are found imbedded in the greatest abundance the roots of plants, and not unfrequently the stumps of trees with the roots attached, precisely as they grow. And, what is still more remarkable and significant, trunks of trees are not unfrequently found almost entire, standing erect, with their roots still bedded in the fire-clay, their trunks passing through the seam, and far into the overlying strata of shale and limestone. By means of evidence of this kind Lyell and Dawson have been able to make out distinctly nearly 60 planes of successive vegetation in the coal field of Nova Scotia. In many of these, viz: about 20, the trees are still in the position in which they grew, as shown in figure 12; of the rest the evidence consisted in the imbedded stigmaria or roots of sigillaria.

Fig. 12.



In the cases in which these trunks and roots, *in situ*, are found, (and they are by no means uncommon,) the evidence is conclusive that the coal was formed on the spot where the trees grew; in other words, that the growth of the trees and the deposit of the coal took place simultaneously on the same spot. This is clearly impossible in an estuary, but is known to take place in every peat swamp.

To recapitulate the whole argument: If we examine a peat bog which has been for many years thickly overgrown with ferns, mosses, and water plants of various kinds, and shaded by many large trees, we find the soil composed entirely of black carbonaceous matter, wholly destitute of structure but revealing its vegetable origin to the microscope, containing fragments of trunks and branches of trees lying in all possible positions, some prostrate, some inclined at all angles, many, both living and dead, still erect, their roots firmly fixed in the clay at the bottom of the bog, below the peaty matter which has slowly gathered about their lower parts, and over the whole lie thickly strewn the freshly fallen leaves. Now suppose such a peat bog to be deeply buried beneath the surface of water and overwhelmed with sediment of clay and sand, and again, after ages, elevated and exposed by section to the scrutiny of the geologist, and we shall have a complete reproduction of the phenomena of a coal seam.

The great, and almost the only, objection which has been urged against this theory is to be found, not in the phenomena of an individual coal seam, but rather in the general phenomena of coal basins, in the repeated alternation in the same locality of coal seams with marine and fresh water strata. We have already seen that there are in the same coal basin sometimes as many as an hundred coal seams, one above the other; now, according to this theory, when the coal seam was forming the spot must have been above the surface of the sea, but when the interstratified limestones and shales were being deposited the same spot must have been beneath the sea-level. Thus, argues the objector, we are driven to the enormous assumption that the same spot has been successively upheaved above and depressed beneath the sea-level one hundred times during the carboniferous period, and, what is still more remarkable, that every time it rose above the sea it became a peat swamp; or if the intervening strata are fresh water instead of marine, the difficulty seems only to be increased.

*Estuary theory.*—It is to meet this very difficulty, to account for this remarkable alternation of strata, that the rival theory has been proposed. An estuary is the wide open mouth of a river emptying into a tidal sea; it is occupied sometimes by fresh and sometimes by salt water. The deposit at the bottom of an estuary, in suitable positions, is, therefore, an alternation of fresh water and marine strata. In seasons of freshets the river water, loaded with sediment and

perhaps bearing rafts of drift timber, forces back the sea water, occupies the estuary, and makes its deposit of clay and sand, containing fragments of such drift timber; in seasons of low water the ocean returns and makes its deposit, perhaps of limestone, and so on alternately. A coal field is supposed by these theorists to be the position of an ancient estuary; the limestone strata are the marine deposit, the shale and sandstone the river deposit, and the coal seam the imbedded drift timber brought down by the river from distant forests.

The objections to this theory are all that has been said in favor of the peat bog theory. The pureness of the coal, the fine preservation of even the tenderest parts of plants, the position of such well preserved specimens always on the upper surface of a coal seam, the structureless character of the great mass of the coal, and, above all, stumps and trunks of trees still erect, with their roots still fixed in the clay stratum below—all this seems not only unaccountable but impossible on this theory.

In comparing these two theories it will be seen that the first explains completely the phenomena of an individual coal seam, but signally fails to explain the general phenomena of a coal basin, viz: the alternation of coal seam with marine and fresh water strata; while, on the other hand, the second explains well this alternation, but fails utterly to explain the phenomena of an individual coal seam. There is, then, real and substantial evidence in favor of each, and equally substantial objections. If this had not been the case one or the other would have been relinquished ere this. But we find, on the contrary, that they have both found strenuous advocates from the time geology commenced to exist as a science until now. In every such case of vitality in rival theories it will be found, I think, that there is a real germ of truth in both—that both are true and both are false; both true in some sense, and therefore reconcilable; and both false through narrowness of view, through exclusiveness, through mistaking a partial for a general view. I can best illustrate my meaning by referring you to the familiar but very instructive fable of the shield, which being distinctly seen by two knights of equally good eye sight and of undoubted veracity, was declared by one to be white and by the other to be black. You will recollect that, after several lances were broken and many wounds and bruises endured to decide the knotty point, it was discovered by some one who, strange to say, was more interested in the truth than in the dispute, *that one side was white and the other was black.* The disputants were both right and both wrong, but wrong only by exclusiveness, by mistaking a partial for a general view. So it is with almost all vexed questions. There is truth on both sides, but both err in excluding the other. We are seeking in the right direction when we attempt to show the partialness of both views. We have risen to a higher view, to a philosophic truth, when we show that these two partial and apparently irreconcilable views may be united into one; these two surface views may be stereoscopically combined.

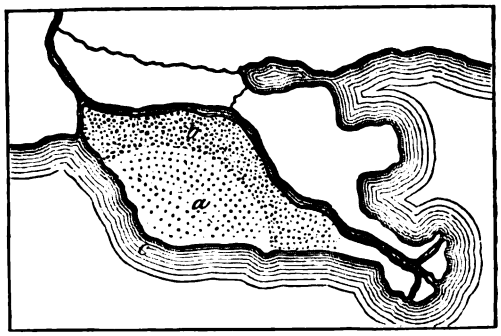
There is an old and much quoted adage, that "truth lies in the middle" between extreme opinions. As generally understood nothing

can be more false or hurtful. Through its influence a merely timid or temporizing policy is mistaken for wisdom, the "fence man" is mistaken for the philosopher. There is another old adage, that "*extremes meet;*" *i. e.*, what to the superficial observer *seem* to be extremes, to the deeper thinker are often really closely allied. But the converse of this proposition, though not erected into an adage, is even more profoundly true, viz: that what *seem* to be closely allied are very often *real* extremes. There is often a superficial resemblance between the highest and the lowest, so that by the unthinking multitude the one is often mistaken for the other; pride for nobility of soul, humility for mean-spiritedness, the serenity of self-command for the serenity of insensibility, &c. It is only in this way that the "fence man" resembles the philosopher, for they are as wide apart as the poles. It is in this way only that truth seems to "lie in the middle," although we are further from it there than anywhere else. To refer again to the fable of the shield: It would have been a poor solution of the famous dispute to say that the shield was neither pure white nor pure black, but midway between the two extremes; that it was, in fact, some shade of gray or dusky, or, perhaps, pepper and salt. No; I repeat, truth lies not "in the middle," but the *reconciliation of extremes* in the *harmonious combination of apparent antagonisms.*

Now, it seems to me that the phenomena of a coal seam already enumerated prove most conclusively that the coal was formed *in situ*, as in the peat swamps of the present day. At the same time the frequent alternation of seams with marine and fresh water strata prove also most conclusively that the deposit took place at *the mouths of rivers.* Here are two incontestible facts. We must put them together; we must combine them if we would make a true and sufficient theory. I believe the more this subject is reflected on the more we shall be convinced that coal was deposited *in peat swamps at the mouths of large rivers*, and therefore subject to overflows by the river and occasional inundations by the sea. We are to look for analogies in existing nature, not among the bogs of Ireland, but among the river swamps of the Mississippi.

It is well known that such peat swamps, some of them of enormous extent, exist now on the margins and in the delta of the Mississippi and probably many other large rivers, and that pure peat unmixed with mud is constantly forming in these swamps, although they are annually flooded by the river. This seems at first incredible, when we recollect that the river water is loaded with sediment, and that sediment prevents the growth of peat plants, or at least would entirely destroy the purity of the peat. But this apparent anomaly has been entirely explained by Mr. Lyell. According to this high authority, although the peat swamps of the Mississippi are annually flooded by river water they are entirely untouched by *river mud.* These favored spots are surrounded, particularly on the side next the river, by dense vegetation, which, acting as a sieve, completely strains the water of its mud before it reaches the pe t swamp. The water of these swamps is therefore pure, and pure peat has been quietly depositing there for ages.

Fig. 13.




Let us now suppose that there existed during the carboniferous period a large river, perhaps less than the Mississippi, but with enormous swamps and delta, overgrown with rank vegetation far surpassing in luxuriance anything we know at the present day. In the midst of such swamps there would evidently occur spots of great extent, the waters of which, for the reasons already mentioned, would never be contaminated with sediment, as at (*a*) fig. 13. Here for untold ages pure carbonaceous matter would accumulate undisturbed. In the course of time the surrounding portions of the swamps (*b*) where the mud is detained would rise by deposit of sediment, while the peat swamp (*a*) would remain as a sunken country, such as exist now in the swamps of the Mississippi. Finally, at uncertain intervals, a more than usually large freshet, or perhaps some change in the level of the land, would deluge the swamp with mud and bury the peat. Gradually the vegetation would return, and the former condition of things be restored, to pass again through the same changes. We have but one other supposition to make, viz: that the whole river swamp and delta were gradually subsiding during the whole carboniferous period. This is by no means a violent supposition, but one which we have a right in this case to make for two good reasons: 1st. We have the best evidence that many of the large deltas of the present day are thus subsiding. This is proved in the case of the Mississippi delta by cypress stumps *in situ* below the level of the sea. 2d. The coal strata themselves give indubitable evidence of gradual subsidence during the period of their deposit. The character of these strata and their fossils shows that they were deposited in shallow water, but their enormous thickness (nearly three miles in Nova Scotia) renders this clearly impossible, unless we suppose such subsidence; for, if the bottom was stationary, it must have been three miles below the surface of the water when the lowest stratum was deposited. Now, if such subsidence went on constantly, but slowly, so that, under ordinary circumstances, the delta could be maintained by deposit from the river, but at uncertain intervals, more rapidly than the river could build up, so that the sea would again usurp possession and make its deposit of limestone, and again more slowly, so that the area might again be reclaimed by the river, and become a peat swamp, and so on alternately, we should easily, without any violent hypothesis, account for all the phenomena of a coal basin.

It will be observed that by this hypothesis the area of a coal basin has, indeed, been successively above and below the sea-surface, but not by successive upheaval and depression, as it has been supposed necessary on the peat bog theory, but by the contention, with various

success, of opposing forces, aqueous and igneous, the river constantly building up, and igneous forces beneath as constantly striving to depress; sometimes one force predominating, sometimes the other. Of such contention we have many instances in existing nature. It is evidently going on in the delta of the Mississippi at the present time.

It may not be possible, in the present condition of science, to picture to ourselves all the circumstances connected with this process. Perhaps I have already gone too far in this attempt; but the general facts upon which the theory rest are incontestible. Coal has almost certainly accumulated *in situ* in extensive peat swamps at the mouths of large rivers, upon ground which was slowly subsiding during the whole period. Under these circumstances it seems not difficult to account for all the phenomena of a coal basin. All we have to do in future is by study of the peat swamp of the Mississippi and the phenomena of delta deposit to discover the details of the process, to fill up the outline of the picture.

There is a fact noticed by Mr. Lyell, which is strongly confirmatory of this theory. In the sandstone of the coal measures it is common to find trunks of trees, but only trunks—no small branches, leaves, or tender parts. Moreover these trunks are observed to be mostly pines, highland trees, while the trunks in the coal seam proper are sigillaria, lepidodendron, calamites—swamp trees. Now, when we recollect that coarse sandstone is the deposit of rapid current, does it not seem evident that the sandstone was deposited by the freshet which overwhelmed the peat swamp, and that the pine trunks are the remains of drift timber brought from the highlands. Here, then, we have ancient drift timber, but how different from a coal seam!

Let us now attempt to estimate approximatively the *time necessary* to bring about these stupendous results. I believe we should never neglect an opportunity of this kind, because the popular mind has not yet grasped the idea of illimitable time required by geology to the same extent as it has the idea of illimitable space required by astronomy; and, as I believe, this is one of the greatest difficulties with which geology has to contend.

According to Boussingault luxuriant vegetation at the present day takes from the atmosphere about a half ton of carbon per acre annually, or 50 tons per acre in a century. Fifty tons of carbon of the specific gravity of coal, about 1.50, spread evenly over the surface of an acre, would make a layer of less than $\frac{1}{3}$ of an inch. Humboldt makes the estimate a little higher, viz: $\frac{1}{2}$ an inch. We are willing to take the higher estimate. It appears, then, that if *all* the carbon taken from the air was preserved in the form of coal, our most luxuriant vegetation would make but a $\frac{1}{2}$ inch of coal in a century. But in the coal measures the aggregate thickness of the coal seams in the same basin is sometimes 150 feet or more. In 150 feet there are 1,800 inches, or 3,600 half inches. At the present rate of vegetation, then, it would take 3,600 centuries, or 360,000 years, to accumulate this amount. But it will be objected that the vegetation of the coal period was probably much more luxuriant than the present, and the tendency of this difference would be to shorten the time. True; but it will be recollected that this estimate was made upon the ground

that *all* the carbon was preserved. This is in the highest degree improbable, not to say impossible. Probably much more than half was returned to atmosphere in the form of carbonic acid and carburetted hydrogen. Again, we have taken no account of the enormous periods of time during which there was no carbon deposited on the spot in question, and represented by the intervening strata of limestone, sandstone, and shale. The estimate we have given above, therefore, probably falls very far short of the truth. Let us try another.

According to Messrs. Lyell and Dawson the coal strata of Nova Scotia are about three miles in thickness at the South Joggins. At another point, nearly 100 miles distant, (Albion mines,) they found the thickness nearly the same. There is little danger, therefore, of erring on the side of excess, if we take the average thickness of the strata over the whole basin at one and a half miles. Now, the area of this coal field, according to Mr. Lyell, is about 3,600 square miles. This would give, as the solid contents of these strata, 54,000 cubic miles. But we have already seen that this enormous amount of matter was almost certainly accumulated at the mouth of a great river. Let us see how long it would take one of our great rivers to do the work. I shall select for this purpose the Mississippi and the Ganges, because they are both very large rivers, carrying vast amounts of sediment, and because accurate observations have been made as to the amount of sediment brought down by them. These observations have been made upon the Mississippi by Drs. Forshay and Reddell, of New Orleans, and by Captain Strachey, British engineer, upon the Ganges. According to these observations it would take the Mississippi 2,000,000 years, and the Ganges* 375,000 years to perform the work. And yet the period we are now discussing is probably not one-thirtieth, certainly but a small portion of the entire geological history of the earth.

It will no doubt be objected to this estimate that it is founded upon a particular theory, and this theory may be incorrect, and the estimate thus falls to the ground. In answer to this objection it is only necessary to state that we are acquainted with no other circumstances under which strata accumulate so rapidly as at the mouths of rivers. Any other conceivable theory, therefore, would only increase the time.

Again, it will probably be objected that the agencies of nature may have been and probably were more active in earlier periods of the history of the earth than now. Such a notion, although almost universal among intelligent people and very prevalent even among geologists, is, as it seems to me, utterly without foundation in reason. In reference to this point geologists may be divided into two classes. The first and most numerous class hold that the agencies of nature have gradually decreased in activity from the earliest times until now. The other, to which Mr. Lyell and his followers belong, believes that these agencies have acted much as they do now through all time; that there has been no progressive change of any kind, neither in the earth nor its inhabitants. Now, it seems to me that it can be proved, or at

* This amazing difference in favor of a smaller river is due to the fact that the Ganges, being a tropical river, the rains all fall during six months, and are therefore very heavy. The washing of the soil and resulting sediment are necessarily in proportion. The mountainous country in which the Ganges takes its rise contributes also to the same result.

least rendered extremely probable, that neither of these theorists is in the right; that, in fact, while the igneous agencies have been decreasing in activity, the aqueous have been constantly increasing in the same proportion. As I believe I differ from all other geologists in my views on this point, I deem it important to go a little more fully into this subject.

It is generally admitted by geologists, and indeed there is good and substantial evidence of the fact, that the earth has been gradually cooling throughout all geological history from an original very high temperature. We have also, as I believe most geologists will admit, good and substantial evidence that the land has constantly increased both in extent and in elevation with the course of time, while the ocean has as constantly decreased in extent in the same proportion. In other words, these two elements, land and water, have been, as it were, gradually differentiated. Admit these two points and all the rest logically follow.

The activity of igneous agencies depends upon the internal temperature of the earth. As this has constantly decreased the igneous agencies have also decreased in energy in the same proportion. The aqueous agencies, on the other hand, are the result of currents of air and water upon the surface of the earth; and the rapidity of these currents depends, not upon the *mean* surface temperature, but upon the difference of temperature in different parts of the surface; *i. e.*, between pole and equator or between land and water. It only remains to prove, then, that this *difference* of temperature has been constantly increasing with the course of time.

Land, as is well known, is both a better absorber and a better radiator of heat than water; *i. e.*, will both heat faster and cool faster under given circumstances than water. A globe of land would be both hotter at the equator and colder at the poles than a globe covered with water and exposed to the same influences. Although the *mean* temperature would be nearly the same in the two cases, the *difference* of temperature would be much greater in the former than in the latter. It follows, therefore, that as the extent of land increased and that of the ocean decreased with the course of time the difference of temperature between pole and equator must have increased in the same proportion. The gradual decrease of the *mean* temperature would evidently contribute to the same result; for it is evident that with a higher mean temperature a larger portion of water would exist in the form of vapor. This excessive vapor would rise into the atmosphere and become condensed into universal clouds, mist or fogs, but seldom, and to a very limited extent, in the earlier periods of the earth's history, into *rain*, because, as yet, there were neither extensive high land nor cool currents sufficient for extensive precipitation. Thus would result a thick, murky atmosphere, enveloping the whole earth. The necessary effect of this would be still further to prevent absorption of heat at the equator and radiation at the poles, and thus to produce still greater uniformity of climate. In the earliest geological periods, therefore, when the surface temperature, from *internal* causes, was very great, and the ocean almost universal, the difference of temperature between pole and equator was reduced to a minimum. In such a condition of things it is evident

that the exchange between pole and equator currents of the aqueous and aerial ocean must have been not only very sluggish but perfectly regular northeast and southwest currents in the northern hemisphere, and northwest and southeast currents in the southern. In proportion as the earth cooled the diversity of temperature between pole and equator became greater and the exchange more rapid. In the meantime the gradual increase in the extent and elevation of continents would introduce still greater diversity. The regular oceanic currents, by impinging upon the continents, are reflected in various directions, increasing still further the diversity of climate. Currents of the air, too, are no longer only trade winds, but also monsoons, land and sea breezes, &c. These various currents, mingling and contending, produce the infinitely varying winds of the present epoch. But the most important current we have not yet spoken of. Land and sea may be considered the two poles of a circulating apparatus; water rises in the form of vapor at one pole, passes over through the atmosphere, and is condensed on the other in the form of rain, and so back by the rivers to the ocean. The more rapid the condensation the more rapid the evaporation and the more rapid the circulation. Within certain limits, (*i. e.*, until the land is sufficient to condense all the water evaporated from the ocean,) the amount of evaporation and condensation is in proportion to the extent and elevation of the continents. It is evident, then, that in the earlier periods of the earth's history, when the ocean was almost universal, although the air was saturated with moisture, there was comparatively little rain; and that just in proportion as the continents increased in extent and elevation, evaporation, and condensation would increase in the same proportion. It is impossible to resist the conclusion, then, that from the earliest periods until now there has been a constant increase in activity and variety of currents of ocean and atmosphere; of wind and rain; of cloud and sunshine; of fountains and rivers; in fact of all that constitutes the life, variety, and beauty of our beloved earth.

Thus it appears that at first igneous predominated over aqueous agencies. It was this very predominance which caused uncompensated, progressive change—*development* of the earth as a whole; for perfect balance is incompatible with developement. But gradually aqueous agencies increased in energy; the antagonistic forces approached a balance as the earth approached maturity, until at present the balance may possibly be complete.

In all I have said I have had in view, of course, only the ordinary regular operation of aqueous agencies, or what Mr. Lyell calls "causes now in operation." I say *of course*, because the extraordinary, irregular operation of these agencies, such as are called "*debacles*," &c., are too uncertain and hypothetical, not to say improbable, to form the basis of any reasoning whatever. I repeat, then, that during the coal period the ordinary operation of aqueous or degrading agencies must have been more slow than at present. The accumulation of a certain amount of material in a river delta, other things being equal, would require a longer time than now.

### CLIMATE OF THE COAL PERIOD.

It is probable, from what evidence we have on this subject, that the climate of the coal period was characterized by greater warmth, greater humidity, and greater uniformity than now obtains, and that the air was more highly charged with carbonic acid. Of the greater warmth of the climate we have evidence in the astonishing luxuriance and universal tropical character of the vegetation of the period. One of the most marked peculiarities of the flora of coal everywhere is the great relative abundance of ferns and fern allies. In the present flora of Great Britain the ratio of ferns to flowering plants is about 1 to 35, while in the coal flora of the same country nearly one-half of all the known plants are ferns. In the American coal flora the proportion of ferns is said to be still greater. That this abundance of ferns indicates a tropical climate is shown by the fact that in the existing flora, out of about 1,500 known species of ferns, 1,200 are confined to the tropics, and as we pass from the equator towards the poles the proportion of ferns, steadily diminishes. The same may be said with reference to the club-mosses. It is worthy of remark, too, that although conifers are abundant now all over the earth's surface, still those most nearly allied to the conifers of the coal—such, for instance, as the araucaria and salisburia of the present day—are found only in tropical regions. Now, during the coal period, this tropical vegetation extended as far as 75° north latitude. Tree ferns and gigantic club-mosses covered the spot now occupied by the Mellville island. The evidence of remarkable humidity is no less satisfactory, for it is only in warm, *moist* climates that ferns and club-mosses grow in the greatest abundance and luxuriance. On some islands in the tropics and in the south seas the abundance of ferns even approaches that of the coal flora. In fact, as a condition of the growth of these plants, moisture seems even more necessary than heat.

It has been objected to the greater heat of the climate, that coal was evidently formed by accumulation of carbonaceous matter *in situ* as now in peat bogs, and that peat bogs are found only in cool climates. The answer to this objection is not difficult. It is not the heat immediately, but the resulting *capacity for moisture*, or, in common language, dryness of the air of the tropics, which under ordinary circumstances prevents the preservation of carbon. The air is not so constantly at or near the point of saturation. Fogs, and mists, and clouds are not so constant as in cooler climates. But we have supposed greater humidity as well as heat during the coal period.* Under these circumstances, there is no reason why peat should not accumulate. We see proof of this in the peat swamps at the mouth of the Mississippi. Here we find peat accumulating in great abundance in a climate which is yet very warm; and we have already seen that it is in such peat swamps, rather than in the bogs of cooler climates, that we are to look for analogies with the peaty accumulations of the coal period. The enormous *extent* of these peat swamps becomes in its turn an additional proof of the great humidity of the climate.

The uniformity of climate—*i. e.* the comparatively equable distri-

bution of heat and moisture on the surface of the earth during the coal period—is evidenced by the remarkable uniformity of the flora. The general character of the coal flora was very much the same in every portion of the earth's surface, and in many cases even the same species are found in the most distant countries. Thus many identical species have been found in Europe, United States, New Holland and Mellville island, countries the existing flora of which differ entirely. Now, although I cannot accede to the doctrine that diversity of climate is the *physical cause* of diversity of fauna and flora, yet, whether we consider the physical or the final cause, the result would evidently be the same, viz: the perfect harmony between the climate and the fauna and flora, the perfect adaptation of the one to the other.

That the atmosphere was highly charged with carbonic acid is rendered probable by the astonishing luxuriance of the vegetation of the period. Some experiments recently made by Mr. Gladstone seem to show that up to a certain limit the growth of ferns is rendered more rapid by the addition of carbonic acid to the atmosphere in which they grow. This probably becomes a certainty, when we reflect upon the enormous amount of carbon contained in the coal deposits, all of which must have been extracted from the atmosphere. It has been estimated that "all the forests of the United States gathered into one heap would fail to furnish materials of a single coal seam equal to that of Pittsburg." Again, that "that there is laid up in the earth, in the form of coal, six times as much carbon as now exists in the atmosphere. If it was all returned to the air, there would be seven times as much carbonic acid in the atmosphere as at present."

*Cause of the climate of the coal.*—Much speculative ingenuity has been exhausted to little effect in attempts to account for the remarkable climate of this period. We find here the same looseness of reasoning unfortunately so common among geologists when dealing with physical subjects. The subject of most of this speculation has been the cause of the supposed greater heat of the climate. There are two principal methods of accounting for it. The first and most obvious mode is by means of the commonly received hypothesis that the earth has cooled down to its present temperature from an original state of incandescence. But although there is much independent evidence of this original condition—and we think it extremely probable, therefore, that the heat of the coal period was due, at least in part, to this cause—yet, as Hopkins has shown, (Geol. Jour., 1853,) there are strong objections to this as the only cause. We have already said that the surface temperature of the earth is due partly to internal and partly to external causes. At present the surface temperature from internal causes has become almost nothing, *i. e.* only one-twentieth of a degree Fahrenheit. The increase of temperature below the surface is about 1° to sixty feet. Now, if we supposed the surface temperature from this cause to be increased even to 1°, the increase for every sixty feet of depth would be 20°. An increase of 10° surface temperature would make 200° increase of temperature for every sixty feet. The springs, except the most superficial, would all be boiling. Now, it will be recollected that the winter temperature of Mellville, where coal is found abundantly, is —20° Fahrenheit. It would, therefore, take near

100° additional of surface temperature to raise this to tropical heat. This would necessitate a temperature of 2,000° at the depth of sixty feet, a condition of things, it would seem, utterly incompatible with the existence of luxuriant vegetation on the surface.

The second mode of accounting for it is by means of distribution of land and water upon the earth's surface. Land, as compared with water, is both a better absorber and better radiator of heat, *i. e.*, will both heat faster under the influence of a source of heat, as the sun, and cool faster when that source is withdrawn. This is familiarly illustrated by land and sea breezes. Again: the earth at the equator receives more heat from the sun than it radiates, while at the poles, on the contrary, it radiates more than it receives from the sun, the overplus in both cases being balanced by the currents of ocean and atmosphere. If these currents could be prevented, the equator, for a time, would get progressively warmer, and the poles progressively colder. We may evidently, then, look upon the earth as a body heating at the equator and cooling at the poles. Now, when we recollect the great absorbing and radiating power of land, as compared with water, it is easy to see that the mean temperature of the earth's surface may be materially affected by the distribution of these elements with reference to the two points in question. For instance, if the water be all collected in a belt about the equator, and the poles be occupied entirely by land, we would have the conditions most unfavorable for heating at the equator and most favorable for cooling at the poles. The result would be a considerable lowering of the mean temperature. If, on the contrary, the waters be gathered into polar oceans, leaving an equatorial belt of land, the conditions would be most favorable for heating at the equator and most unfavorable for cooling at the poles, and the mean temperature would consequently rise. It is estimated that these two extreme conditions would bring down the mean temperature to 32°, or raise it to tropical heat. It is not to be supposed that such extreme conditions ever existed; but any approximation to such conditions—for instance, a decided predominance of land towards the equator or poles—would produce the same effects to a corresponding degree. Now, it is possible that the greater heat of the coal period may be due to some such distribution of land and water.

The fatal objection to this explanation is that we find no coal in tropical regions. As every coal field presupposes a large river, and therefore a considerable extent of land, the distribution of coal may be looked upon as in a general way indicative of the distribution of land during the period. It would seem from this that the larger bodies of land existed in temperate and arctic rather than in tropical regions.

But if it is impossible by distribution of land and water to account for the greater *mean* temperature, it is at least easy in this way to account for the *greater humidity* and *uniformity of climate* which we have found equally to characterize this period. I have already alluded to the fact that the palæozoic seas were probably very wide and the land correspondingly small in extent and low, and that such a condition of things, on account of the very limited condensation and precipitation of vapor, would produce a very *humid climate*. Now, water

ng both a bad absorber and bad radiator of heat, both heating very wly and cooling very slowly, it is evident that a great predominance that element would produce, also, a *very uniform climate*. The ference of temperature between pole and equator, and between winter d summer, would be less than at present.

Some geologists think, with Mr. Lyell, that this uniformity and midity of climate is sufficient to account for the coal vegetation thout the necessity of a higher mean temperature than now exists. the present mean temperature was distributed more equably both er the earth surface and over the year, the effect would be to proce cooler equator, it is true, but also much warmer high latitudes, d particularly the winters of high latitudes would be much less rere. The evidence is, however, it seems to me, in favor of some vation of the *mean* temperature also. It is difficult to conceive how y uniformity of distribution of the present mean temperature, such would be produced by the predominance of water, could raise the nter temperature of Mellville island to the point necessary for the xuriant growth of tree ferns. Some increase of temperature from ernal cause seems to be necessary. I suppose, therefore, that if the nperature of the earth from internal causes was slightly elevated, y 10°, so that the mean temperature from 60° should become 70°, d then this mean temperature distributed over the earth surface as iformly as possible, by means of a wide extent of ocean, we should ve all the conditions necessary to produce the phenomena of coal getation. It will be recollected, too, that we have much independnt evidence of the cooling of the earth from an original very high nperature.

With reference to the highly carbonated condition of the atmohere, we may suppose this to be the result of the greater activity carbonic acid producing causes, or else we may refer it to the iginal constitution of the air—the natural process by which carnic acid is given to the air, decomposition, combustion, respiration animals, and volcanoes, carbonated springs, &c. It will be admitted all that the first three may be neglected, since they return to the only what had been previously taken from it. The carbonic acid pplied to the air by volcanoes and carbonated springs, according to schoff, is so inconsiderable that, unless we suppose these sources ich more active than now, it would take millions of years to affect aterially the constitution of the air. But even this refuge is taken ray, when we recollect that volcanoes and springs derive their carnic acid from carbonates, and chiefly from carbonate of lime, or comon limestone. But limestones, according to the testimony of all who ve carefully studied them, and particularly according to the recent croscopic observations of Sorby, are entirely of animal origin, *i. e.* tirely made up of broken fragments of shells, corals, crinoids, somenes recognizable under the microscope, sometimes reduced to impalble powder. This carbonate of lime is evidently derived from a-water. Whence, then, does sea-water derive its carbonate of lime? ie lime is derived, beyond doubt, from igneous rocks, the carbonic id probably from the atmosphere, through the animal and vegetable ngdoms, since lime exists in igneous rocks not as a carbonate but as

a silicate. It would seem to follow, then, that springs and volcanoes, also, only return to the atmosphere what had been previously taken from it. The only difference between these sources and the three first is, that while decomposition, combustion, and respiration return to the air what had been taken from it *but a little while before*, springs and volcanoes return to the air what had been taken from it during some previous geological epoch. Thus the atmosphere becomes the great original source of all the carbonic acid in the world.

But whatever be the cause of the excess of carbonic acid in the atmosphere during the coal period, we cannot fail to see an evident and beneficent design in its removal. Carbonic acid, as is well known, is as poisonous to animals as it is nourishing to plants. Previous to the coal period there lived none but aquatic animals of low order. These, on account of low vitality, sluggish circulation, and little necessity for rapid and constant oxygenation of the blood, have great endurance of carbonic acid. But now the earth was prepared to receive air-breathing animals, the atmosphere must be purified for the purpose. This was accomplished by the astonishing vegetation of the coal period. But observe, and never cease to admire and wonder, that the self-same providential act which purified the atmosphere and rendered the earth a fit habitation for reptiles and birds, had reference also to the coming of man countless ages after, and laid up materials for his use. In the carbon thus silently extracted from the atmosphere was buried a mechanical energy which, after a sleep of millions of years, was to rise again as the great physical regenerator of the human race.

### ORIGIN OF COAL.

It is now universally admitted among geologists that coal is entirely of vegetable origin. There was a time, however, and that not many years ago, when the vegetable or mineral origin of coal was a question warmly contested by the best geologists; but its vegetable character is now so firmly established and so universally admitted that the history of the controversy has lost its interest. I will not, therefore, tire you with its details, but proceed to state the evidence upon which the universal belief is founded.

First, then, the enormous profusion of fossil plants, in the form of impressions of leaves, trunks and branches of trees, fruits, &c., found in immediate connexion with a coal seam, affords strong presumption in its favor. In the second place, this presumption is strengthened, and becomes, in fact, almost certainty in the case of trunks of trees retaining their external conformation, and under the microscope their internal structure even to the minutest sculpturing upon their cell walls, and yet turned to perfect coal. It might possibly be objected that it may be a substitution of one substance for another, similar to what takes place in petrification, where we find, also, the external conformation and internal structure perfectly preserved, but the organic matter all gone, that the ancient trunk having been buried in bituminous matter and thoroughly impregnated therewith, as particle by particle the woody matter was removed by decomposition the bituminous matter took its place, and thus perfectly imitated its

structure. But this objection is forever set aside, when, in the third place, we subject even the most structureless coal to microscopic scrutiny. The distinguished American microscopist, Professor Bailey, of West Point, has been able to detect the unmistakable evidences of vegetable structure even in the hardest anthracite. In fact it may be affirmed that there is no coal which, under careful examination, will not reveal a vegetable structure.

Again: All the stages of gradation between perfect wood and perfect coal may be traced with the greatest certainty. We find the first stage of this process in the blackened semi-bituminized logs of our peat bogs and deltas of the present epoch. The next stage we find in the lignites or brown coal of the tertiary period; the next the highly bituminous coal of the oolite; then the coals of the true carboniferous; and lastly, the anthracites of the same and lower strata. Thus we may trace the whole embryology of coal from its immature to its most perfect condition—may trace and identify all the intermediate links of the chain of conditions of which wood and coal form the extreme limits. But not only in external form and appearance, but also in chemical composition we can trace these several stages. Wood consists of carbon, hydrogen, and oxygen; coal consists of the same elements but in different proportions. In coal the proportion of carbon is greater and of oxygen and hydrogen less than in wood. Now, if we compare the chemical composition of wood, peat, lignite, bituminous coal and anthracite, we find a progressive decrease in the proportion of oxygen and hydrogen, until, in anthracite, we find the carbon almost pure, and absolutely pure in graphite, if we acknowledge this as of similar origin. This chemical evidence is, it seems to me, absolutely demonstrative.

Lastly, direct experiment proves that peat, which we know to be of vegetable origin, may, by strong pressure, be made to assume the hardness, the density, the general appearance, and all the useful properties of coal.

Assuming, then, the vegetable origin of coal as a basis of argument, we will proceed to speak of, and to account for, *the principal varieties of coal.*

All coal consists of two parts, the one combustible the other incombustible. It is easy to separate these from one another. If a piece of coal is thrown into the fire the combustible portion passes away in the form of gases, the incombustible remains behind in the form of ash. Now, the relative proportion of these two vary infinitely in different coals. We have every stage of gradation between pure shale and pure coal, between pure incombustible and almost as pure combustible. In the purest coal the amount of ash is only 1 to 2 per cent.; others, more impure, contain 5, 10, 20, 50 per cent. of ash. At this point coal loses the property of ready combustion, and with it loses also the name of *coal* in popular language. But the geologist recognizes no remarkable change at this particular point—no scientific reason why the name should change from coal to shale, as there is no corresponding change of nature. From this point, under the name of shaly coal, black slate, &c., the amount of ash may continue to increase and the amount of combustible matter to

decrease, until, in pure shale or slate, the whole becomes incombustible.

Now, wood consists also of combustible matter and ash, but the amount of ash in wood is much less than in coal—the wood of elm contains about 2 per cent.; willow, ½ half per cent.; beech, ⅓ per cent.; oak and pine about ¼ per cent. The leaves and bark of trees, however, contain much more than this. The fully matured leaves of the beech, willow, and elm contain, severally, 6.6, 8, and 11 per cent. of ash. It is probable, then, that 2 to 3 per cent. is a fair average of the per centage of ash in dry vegetable matter. But even if the coal is perfectly pure, that is, formed of vegetable matter without foreign admixture, we should find a higher proportion of ash than in the wood from which it was formed, for, as we have already seen, wood loses hydrogen and oxygen in the process of change into coal. The weight therefore diminishes, but the absolute amount of ash remains the same, and consequently the relative amount increases. We may safely say, then, that if coal contains not more than 5 per cent. of ash it may be considered quite pure; but if it contains more than 10 per cent. it is probably impure, *i. e.*, mixed with foreign matter. This foreign matter being evidently the *mud* or *clay* upon which the carbonaceous matter was originally laid down or by which it was afterwards covered. Hence we find the purest coal in the largest seams and in the middle portions equally removed from the floor and roof. As we pass towards the roof of a seam the coal passes by imperceptible degrees into black slate, which is, in fact, mud, more or less mixed with carbonaceous matter.

So much for the varieties of coal depending upon purity or impurity, upon the relative proportion of earthy, incombustible, inorganic matter, and of combustible organic matter.

But, aside from the earthy matter, the combustible or organic matter of coal consists of two proximate elements mechanically mixed, viz: carbon and bitumen; charcoal is nearly pure carbon; common tar or pitch is very similar both in chemical composition and in general appearance to bitumen. If, then, we conceive a piece of charcoal, carefully burnt so that the vegetable structure is perfectly retained, to be thoroughly impregnated with pitch or tar, we should have a substance extremely similar to common coal. These two ingredients of coal may also be easily separated from one another. This is constantly done in the process of coking and in the manufacture of illuminating gas. The more volatile bitumen is driven off in the form of gas or collects in the pipes as coal tar and the carbon remains as coke. Now, the relative proportion of these two ingredients also vary infinitely in different coals. We may have a coal of pure carbon, or a coal of pure bitumen, or a coal containing these two in every proportion. It is the relative proportion of these which give rise to the principal varieties of coal. A coal of pure carbon is called anthracite; with a small amount of bitumen, say 10 to 20 per cent., it is called dry coals or semi-bituminous coal; when there is 20 to 30 per cent. of bitumen it is called bituminous or coking coal; when the per centage is above this and the coal burns with a strong blaze and melts, it is called fat coals. Besides these there are certain varieties depending

upon hardness, fracture, &c., such, for instance, as cannel, which is a highly bituminous coal, but very hard, compact, fine-grained, and remarkably free from vegetable structure; splint coal, &c.

There are at least three possible methods of accounting for these varieties. 1st. The cause may have existed before the coal was laid down, in the nature of the wood of which the coals were formed. 2d. The cause may be sought for in the changes through which the vegetable matter passed in the process of becoming coal. 3d. We may find it in changes to which the coal was subjected after it became coal.

First. It is possible that the kind of wood may in some degree determine the variety of coal, as, for instance, the accumulation of pines and other resinous wood may have given rise to the fat coals, while the non-resinous woods to the drier coals. This, I say, is possible, particularly as we know that coniferous trees grew in considerable abundance during the coal period; but it seems very improbable as a general explanation.

Second. We have already remarked that wood consists, chemically, of carbon, hydrogen, oxygen, and a small quantity of nitrogen, which may be neglected; and that pit coal consists of the same chemical elements, only in different proportions, the carbon being in excess. It is obvious, then, that in the fermentation process by which wood is changed into coal a portion of the gases, hydrogen and oxygen, escapes. The amount which thus escapes determines the variety of coal.

The composition of wood is variously stated by chemists; in fact it is not a definite compound, but consists of the mixture of several proximate principles. It therefore varies much, according to the relative abundance of these principles, such as starch, sugar, cellulose, lignire; in other words, according to the kind or even the age of the wood. For the harder kinds of wood, such as the oak, Liebeg gives the formula, $C_{36}\ H_{22}\ O_{22}$. For softer kinds of wood, and particularly for succulent vegetable substances, the proportion of carbon is not so great. Whether, however, the formula which I have adopted be correct for the plants of the coal, or not, would not affect the general correctness of the reasoning upon which my conclusions are based. The composition of bitumen varies also very much, and for the same reason, viz: that it is composed of several proximate principles variously mixed. It is generally given as $C_{20}\ H_{16}$, and a variable but small amount of oxygen, from 2 to 4. The composition of cannel coal is given by Regnault as $C_{24}\ H_{13}\ O_1$.

Wood..... $= C_{36}\ H_{22}\ O_{22}$
Bitumen.... $= C_{20}\ H_{16}\ O_2$
Cannel coal $= C_{24}\ H_{13}\ O_1$

It will be seen that the proportion of carbon is greatest in coal and least in bitumen, but that the most striking difference between these substances and wood is the almost entire want of oxygen. Now, according to Liebeg, wood in the process of decay in the open air forms carbonic acid ($C\ O_2$) and water ($H\ O$,) and the carbonic acid is formed by the union of the carbon with the oxygen of the *wood*, while the water is formed by the union of the hydrogen of the wood with

the oxygen of the *air*. As in the formation of carbonic acid, oxygen is consumed faster than the carbon; if the decay goes on the residue will be at least pure carbon.

Wood ..... $= C_{36}\ H_{22}\ O_{22}$
Deduct $C\ O_2 + H$ (the H unites with O of air) $= C_{35}\ H_{21}\ O_{20}$ = partly decayed.
Deduct 5 $(C\ O_2)$ $(= C_5\ O_{10}) + 11$ H..... $= C_{30}\ H_{10}\ O_{10}$ = further decayed.

But if decomposition take place out of contact, or with limited supply of air, the process is more complex. The carbon, hydrogen, and oxygen combine with one another in various proportions, and the products of decomposition are: carbonic acid ($C\ O_2$,) carburetted hydrogen ($C\ H_2$ or $C_2\ H_2$,) and water ($H\ O$,) and thus result the deadly choke-damp ($C\ O_2$) and the dreaded fire-damp ($C\ H_2$) of the coal mines.

Let us now see how, according to this theory, the different varieties of coal may be formed.

$$\begin{array}{lcl} & \text{Wood} = & C_{36}\ H_{22}\ O_2 \\ \left.\begin{array}{l}\text{Deduct } 11\ C\ O_2 = C_{11}\ O_{22} \\ \text{Deduct } 22\ H \text{ oxydized by the air}\end{array}\right\} & \ldots\ldots\ldots = & \underline{C_{11}\ H_{22}\ O_{22}} \\ & & C_{25} \end{array}$$

and twenty-five atoms of carbon alone remain; and this is the compostion of pure anthracite. Again: If decomposition takes place out of contact of air, bitumen or bituminous coal is formed. Thus—

$$\begin{array}{lcl} \text{Wood} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & = & C_{36}\ H_{22}\ O_{22} \\ \left.\begin{array}{l}\text{Deduct } 9\ C\ O_2 = C_9\ O_{18} \\ \text{Deduct } 3\ H\ O = H_3\ O_3 \\ \text{Deduct } 3\ C\ H_2 = C_3\ H_6\end{array}\right\} & = & \underline{C_{12}\ H_9\ O_{21}} \\ \text{The remainder is cannel coal} \ldots\ldots\ldots\ldots & = & C_{24}\ H_{13}\ O_1 \end{array}$$

Again:

$$\begin{array}{lcl} \text{Wood} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots & = & C_{36}\ H_{22}\ O_{22} \\ \left.\begin{array}{l}\text{10 atoms carbonic acid} = C_{10}\ O_{20} \\ \text{3 atoms olefiant gas} = C_6\ H_6\end{array}\right\} & = & \underline{C_{16}\ H_6\ O_{20}} \\ \text{the remainder is bitumen} \ldots\ldots\ldots\ldots\ldots\ldots & = & C_{20}\ H_{16}\ O_2 \end{array}$$

In the same manner, by supposing the union of these three elements to take place in various proportions, under circumstances of more or less imperfect access of air, we may, without difficulty, account for all the different varieties of coal.

There can be no doubt, it seems to me, that bituminous coal is actually formed by this play of affinities. But with reference to the extremes of this series, viz: anthracite and bitumen, naptha, &c., it seems much more probable that these have been the result of an *after change*, the last of the three possible causes with which we started.

In the third place, then, we have many reasons for believing that bituminous coal is really the normal coal, and that which is always formed by the play of affinities, of which we have spoken above, and that anthracite and bitumen are the result of the action of igneous agency upon such bituminous coal.

We have already said that bituminous coal may be considered as a mechanical mixture of carbon and bitumen, and these two may easily be separated by heat. Anthracite is the residue after separation, and bitumen and naptha is the matter separated by distillation and condensed elsewhere. As in the gas manufactories we find bituminous coal decomposed—a part remaining behind as coke, (pure carbon,) a part passing off as gas and a part collecting in pipes as *coal tar*—so in the laboratory of Nature coal beds subjected to heat give rise to the same three substances; anthracite is left behind, coal gas is discharged into the atmosphere and bitumen collects in subterranean pipes and gives rise to naptha and bituminous springs, pitch lakes, &c. Thus, the enormous lake of boiling pitch in Trinidad is, probably, in connexion with coal strata below. If so, such coal will be left in the condition of *anthracite*. All the strata of the earth are subject to change under the influence of heat: limestones become marbles, clays become slate. This change is called by geologists metamorphism. Now, the proposition is that anthracite is metamorphic coal. The proofs of this proposition are as follows:

In the first place, anthracite is never found except in regions very much disturbed by igneous agency, the strata highly inclined, contorted and broken; and even in the same coal field the coal is anthracite or bituminous, according as the region is more or less disturbed. Thus, in eastern Pennsylvania, where the coal strata are very much contorted and sometimes perpendicular, (fig. 9,) the coal is all anthracite; while in western Pennsylvania, where the strata are nearly horizontal, the coal is bituminous. The *actual* transition of anthracite into bituminous coal cannot be studied with advantage in Pennsylvania, because the coal strata have been carried away to such an extent that only outlying patches are left; but in Wales the same seam may be traced from the bituminous to the anthracite condition; so that there can be no doubt that, in this case at least, anthracite is metamorphic coal.

Second. Anthracite is never found except in metamorphic rocks, and conversely all coal contained in metamorphic strata is anthracite. This universal connexion of two things proves, as it seems to me, beyond doubt, their community of origin; that they have a common cause. Thus, in the lowest stratified or primary rocks, where the rocks are altogether metamorphic, and even in the silurian, where a less complete metamorphism is almost universal, what little coal is found is always anthracite. In the coal measures we have coal both bituminous and anthracitic, but the anthracite always in altered and the bituminous in unaltered rocks. As we pass upward we find anthracite more rare, because metamorphism is more rare and local; and when metamorphism entirely disappears in the tertiary rocks we find that anthracite disappears also.

Third. Trap dykes, as it is well known, are formed by the outbreaking and outpouring of melted rock (lava) forced up through the superincumbent stratified rocks, which are altered and rendered metamorphic by the contact. Now, when a dyke passes through coal strata the coal is always thoroughly coked by the contact; that is, it is changed into a substance identical in chemical composition with

anthracite. These two substances are doubtless similar in their origin as well as in chemical composition, the great difference in their density being due only to the pressure under which the change took place. Anthracite is produced slowly under enormous pressure, while coke is produced under ordinary atmospheric pressure, and the rapid disengagement of gas renders it light and porous.

### THE PLANTS OF THE COAL—THEIR STRUCTURE AND AFFINITIES.

Geology is the latest developed among the sciences. This is not an accidental phenomenon in the history of human intellectual progress, but one absolutely necessary, and the cause of which we can clearly trace. The great divisions of science in the order of their complexity are mathematics, mechanical sciences, chemical sciences, organical sciences, and geology. The first is limited to ideas of number and quantity; the second comprises, in addition to the preceding, ideas of force; the third, in addition, ideas of chemical affinity; the fourth, in addition to the preceding, ideas of *life*, and the last, in addition to all the preceding, ideas of historic development. Now, this order of increasing complexity has necessitated a corresponding order of development in time. It is impossible that mechanics and physics should have assumed even the form of a science until mathematics was already mature. And so of the rest. Together they form a column, of which mathematics is the pediment and geology the capital; or, rather, I should say, a magnificent temple, of which mathematics forms the solid foundation and geology the *heaven* pointing spire; the most wonderful and perfect work which human genius has erected in honor of Deity.

It is evident, therefore, that geology was compelled to await the development of other sciences. She could not come forward until her time was fulfilled, for her problems are the most complex and difficult which are to be found in the whole range of science. It is evident, also, that the geologist must be thoroughly accomplished in all departments of science. He must be thoroughly grounded in mechanical and physical sciences, or how shall he reason successfully on the upheaval of continents, the formation of mountain chains, the dynamics of earthquakes and volcanoes, the actions of currents, &c. He must be familiar with chemistry, for disintegration and consolidation of rocks, the deposits of springs, the formation of coal, are chemical questions. Still more necessary to him is an acquaintance with organic science, for the organic remains are the Divine hieroglyphs in which the history of the earth is recorded. It is this very complexity, this very elevation in the scale, this almost universal culture required of her votaries, which constitutes the greatest obstacle in the way of real progress in this science. I know it is thought by many that geology is an easy and simple science, that any one, by industrious collection of fossils and persevering exercise of memory, may be a good geologist; but this is a sad and very pernicious error. In so vast a science collectors of materials must be numerous, but the philosophical generalizer is very rare. In so vast an edifice the fetchers of stone and brick and mortar are innumerable, but heaps of brick and stone and

rtar do not constitute a temple; the one may be accumulated by human hand, the other can be constructed only by the human ıd, and in this case only by genius of the highest order. In fact, ıaster builder in this science has not yet lived. No man has yet n able to sketch the outlines of this noble work with a hand so firm decided that all shall labor in harmony and mutual confidence, the work shall thenceforward proceed with steadiness and cer- ıty.

n some sense, therefore, all departments of science may be looked ın as the handmaids of geology. And it is curious and instructive bserve how, in reward for their services, she stamps each one with seal of philosophy; how each science becomes, in her service, re comprehensive, more philosophic, more exact. The problems hysics and chemistry which geology proposes are so difficult, the ditions under which well known forces act are so numerous and ıplicated, and the scale on which they operate are so vast, that ry formula must be revised, every law must be made more exact. ıs, under the guidance of geology, these two old and mature nces seem entering on a new and higher career.

ut perhaps the most remarkable instance of the favorable change philosophic character which the advent of geology has impressed n other departments of science is to be found in the case of natural ory.

he zoology and botany of the last age were little more than the wledge of the names and external forms of species, and their ar- gement according to an arbitrary system of classification. But it vident that such zoology and botany can be of little service to logy. The external form of an extinct species is seldom seen. ıerally all that we have of an animal is a few bones or teeth, some- es a single scale; of a plant, a fragment of wood or a leaf, and the blem which geology proposes is, from such meagre materials to nstruct the whole organism. To the unskilled this seems impos- e. But the harmony which exists between all parts of an organ- is so perfect that each may be said to necessitate every other. A ıplete knowledge of the laws of organization would thus enable us, n any one part, to reconstruct the whole. One strain of song in- ıtly suggests all that is necessary to make the harmony complete. ıs a profounder knowledge of animals and plants becomes neces- —a knowledge not only of external forms, but also of internal ıcture and the harmonious relation of parts. Classification is no ger an ingenious artifice to facilitate the acquisition of knowledge, becomes the highest expression of knowledge, the epitome of na- . Thus, from a mere mass of barren details, natural history has n to the highest philosophic rank. Even astronomy has been pelled to take a lesson of philosophy from her younger sister. must relax the severity of her dogmas. She must modify some- ıt the absoluteness of her assertions concerning the stability of all ıgs, fenced, though they be, round about with mathematical for- æ, now since the idea of infinite time has been introduced by logy. "The causes which tend to destroy the stability of the solar em," says astronomy, "are infinitely small, and therefore may

be rejected from the equation." True, but infinitely small quantities accumulating *through infinite ages* become *finite*, in fact, become very important; for it is these very same infinitely small residual quantities, rejected by astronomy as of no value, which, by their accumulation, constitute the progressive development of the earth and solar system. Without such small uncompensated forces history, whether geological, national, or individual, would be impossible. An insect philosopher, the span of whose life is a single day, attentively observing the daily cycle of the healthy human body, might rationally assert the *stability of the human system*. The body, at the end of twenty-four hours, has come back to the same spot whence it started. At least the variation, if any, must be infinitely small, and therefore, for all purposes of insect life, may be rejected as of no value. And yet it is the accumulation of this same infinitely small variation which constitutes the growth and progressive development of the body. This is not an exaggerated illustration, for 2,000 years, the whole age of astronomy, is but one day, yea, but a small fraction of a day, in the geological history of the earth.

The flora of the coal period is more complete than that of any previous or succeeding geological epoch. The whole number of fossil species of plants known is probably not far from 2,000. Of these, according to estimates made more than ten years ago, about 816 are from the "coal measures." The constant additions which have been made since that time, particularly by Dr. Newberry and others, from an examination of the coal fields of our own country, would probably bring the number up to at least 900. Probably, therefore, nearly if not quite one-half of all known fossil plants belong to this period. I have already said that a coal seam is made up of the remains of such plants, yet it is not in the coal seams themselves that we find the best preserved specimens of coal plants. On the contrary, the vegetable matter is here so thoroughly disorganized that it is only by means of the microscope that we are able to detect its original structure. It is rather in the associated shale strata that the most beautiful impressions occur, particularly in the overlying *black slate*. Between the thin sheets of this slate the stems and leaves are as perfectly preserved, every vein and nerve, as between the leaves of the botanist's herbarium. This fact, viz: that the well-preserved plants are always found in abundance in this position, and never in the coal seam proper has, as it seems to me, an important bearing upon the theory of coal deposit. But of this we shall speak again in another place. You have here before you a magnificent slab of black slate, profusely covered with beautiful impressions of leaves and stems of ferns and calamites. In this case, as perhaps in most others, the impressions, though well-defined, are not conspicuous at a distance, because the color of the ground and of the figures are so nearly alike, but in some cases, when the shale background is light-colored, the relief of the coal-black impressions is very beautiful. The newly exposed roof of a coal mine has been compared by Dr. Buckland to the most magnificent fresco painted ceilings of Italian buildings.

But although the number of species of coal plants is so great, yet

*coal* is supposed to be composed principally of the remains of four families only, viz: *Ferns*, *Sigillariæ*, *Lepidodendrons*, and *Calamites*. The abundance of individuals belonging to these families is so great, and their size so enormous, that they must have given character to the vegetation of this period, and may therefore be taken as representatives of its flora. As such, therefore, I shall consider them, and it will be our object in this lecture to give you some idea of their appearance and affinities.

There are certain periods in the history of our race upon which we are apt to gaze with peculiar interest and admiration—when the human mind, awakening from its sleep of barbarism, rejoices in the ostentatious display of its strength and its beauty, so in the history of our earth, the period of the coal stands out beyond all others as the "*heroic age,*" when nature seemed to delight herself in the fantastic exercise of power, and to exhaust her strength in the production of vegetable giants and monsters. It will be my object to show that this age, although to the popular mind it may appear a mythological age, an age of wonders and prodigies, an age to which ordinary principles of reasoning are inapplicable; that this age is but one chapter, a page, in a connected history, one step in the accomplishment of the unvarying plans of Deity.

A glance at these drawings of coal plants will give you some general idea of the strange forms which constituted the flora of this period. But it is not only a vague general idea of external form which I wish to give you; we have already had too much of this in popular lectures on geology. If we would grasp the real thought expressed in the vegetation of this period; if we would understand the true significance of the coal flora in the Divine economy; if we would catch the keynote of this Divine harmony, we must take more than a superficial glance—we must look deeply, thoughtfully, reverently. But, in order to make myself understood, I find it necessary to step a little out of the way, to give you a sketch of the great divisions of the vegetable kingdom and the characteristics of each, so that, by comparison, we may be able to determine the position of the coal plants. Whatever is noble and elevating in science must be equally interesting to every intelligent mind; but in order to appreciate it, it is absolutely necessary to master in some degree uninteresting technicalities. The jewel is inclosed always in an unattractive casket of lead; we must find the key before we can gain the prize.

The vegetable kingdom, then, is divided into two great classes: the *Phænogams*, or flowering plants, and the *Cryptogams*, or flowerless. The *Cryptogams* may be again divided into cellular and vascular *Cryptogams*. The cellular *Cryptogams*, such as the mosses, fungi lichens, sea weeds, &c., consist entirely of cellular tissue, while the vascular *Cryptogams*, such as ferns, club-mosses, equisetaceæ, (horse-tails,) combine the vascular tissue with the cellular. The *Phænogams* may also be divided into two sub-classes, viz: the *Gymnosperms*, or naked seeded plants, and the *Angiosperms*, or covered seeded plants. The *Gymnosperms* bear their seeds naked or exposed, either near the base of an open capillary leaf, as in the pine family, (*Conifers*,) fig. 12, or else

on its edges, as in the cycas family. Figs. 12 and 13 represent cross sections of the capillary leaves of naked seeded plants. The *Angiosperms*, on the contrary, bear their seeds enfolded within the capillary leaf or seed vessel, (figs. 14 and 15,) as in all the ordinary flowering plants. The *Angiosperms* are again subdivided into *Monocotyledons*, (one cotyledon or seed leaf in the embryo,) fig. 16, and *Dicotyledons*, (t wo seed leaves in the embryo,) fig. 17.

Fig. 12.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

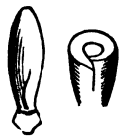
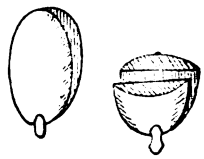


Fig. 17.



| | | |
|---|---|---|
| Phænogams, | Dicotyledons, | Angiosperms. |
| | Monocotyledons, | |
| | Conifers & Cycadæ, | Gymnosperms. |
| Cryptogams, | Vascular Cryptogams. | |
| | Cellular Cryptogams. | |

Now, the most important means of determining the families of coal plants are the *internal structure of the stem* and the *venation of the leaves*. Generally, indeed, these are the only means at our command. Let us inquire, then, how the great divisions of the vegetable kingdom are characterized in these respects.

Among *Phænogams* there are two very distinct types or plans of internal structure of the stem, viz: the *Exogenous*, or outside-growing, and the *Endogenous*, or inside-growing; the one represented by the hard-wood trees and shrubs, the other by the palms, canes, grasses, &c. On cross section of an exogen (fig. 18) we find three distinct zones of tissue. In the centre a zone of cellular tissue, the pith; exterior to this a zone of wood, and around this again a zone of cellular tissue, the bark. The zone of wood is, moreover, subdivided into concentric rings, which represent the annual layers of growth, and separated into wedges by radiating lines of cellular tissue (silver grain) connecting the cellular tissue of the pith with the cellular tissue of the bark. In the *Endogens*, on the contrary, we have the woody tissue in the form of thread-like bundles, irregularly interspersed amongst the cellular. The dry stalk of an Indian corn is a familiar illustration of this structure. If such a stalk is broken across and the two parts carefully separated, the thread-like bundles of woody and vascular tissue are observed to draw

Fig. 18.

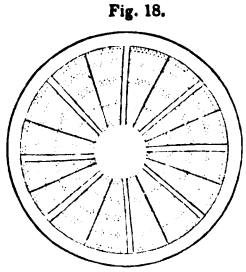
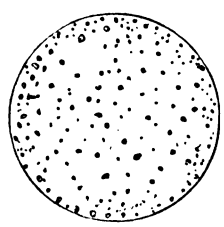


Fig. 19.

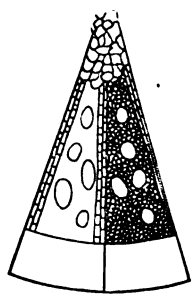


out from the softer cellular tissue. Here we observe no distinct pith; on distinct bark separable from the wood; the wood not collected into a distinct zone; not arranged into concentric layers, nor divided by medullary rays. The exogenous plan of structure includes the *Dicotyledons* and the pine and cycas families; while endogen may be considered synonymous with monocotyledon.

In the vascular *Cryptogams* the woody and vascular tissue is still differently arranged. The stem of a club-moss, for instance, consists of a mass of cellular tissue inclosed in a rind of the same tissue more condensed, with a single central thread of vascular tissue. Sometimes there seems to be in the centre of this something like a very imperfect pith. The cellular *Cryptogams*, as their name indicates, consist entirely of cellular tissue.

It will be observed that, in the general structure and mode of growth, the family of pines (*Gymnosperms*) is allied to the highest order of plants, viz: the *Dicotyledons*, while in its reproduction it is below the *Monocotyledons*. This latter position is beyond doubt the true one; and a more attentive examination of the wood of pine in comparison with that of *Dicotyledons* will confirm us in this view. As this is a very important point, and as much false theorizing on the subject of the plants of the coal has been the result of a misconception of the true position of conifers, I will dwell a little more minutely than I should have otherwise considered it necessary to do.

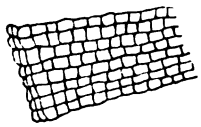
Fig. 20.

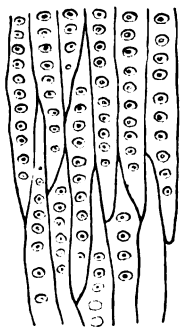


The wood of *Dicotyledons* consists of two distinct tissues, viz: the woody tissue proper and the vascular tissue. The woody tissue proper is composed of elongated cells, too small to be distinguished by the naked eye, while the vascular tissue is composed of very much larger cells or tubes. The visible pores in such wood as oak, chestnut, vine, &c., belong to this tissue. Fig. 20 represents cross section of two wooden wedges, with their medullary rays. The comparative size of the wood cells and the vessels is well shown. The difference is often much greater than in the figure. In pine wood, on the contrary, there is no distinction of woody and vascular tissue; but the so-called wood consists entirely of an open, thin-walled tissue, intermediate in every respect between the vascular and the woody layer and thinner walled than the true woody, but smaller than the true vascular. This is shown in the cross section, (fig. 21.) On a longitudinal section, (fig. 22,) the cells of pine wood are marked by large disc-like elliptical plates, which are entirely characteristic of this family. The smallest fragment is sufficient to distinguish it with the utmost certainty.

Now, if we trace the development of the tissues, either by passing from the lowest to the highest plants, or from the earliest embryonic to the mature condition of one of the higher plants, we shall find that all the different kinds of tissue are modifications of the cellular; that there is a more and more complete differentiation of form and special-

Figs 21 and 22.



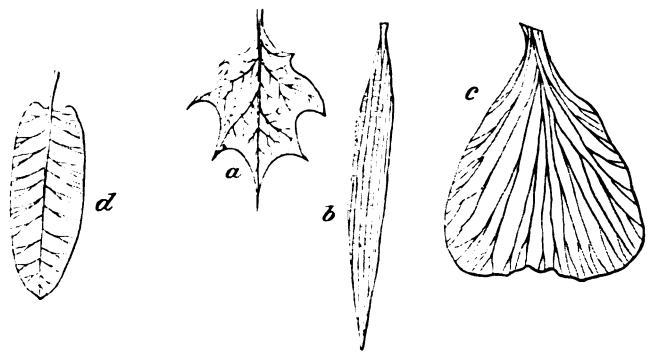


ization of function as development progresses. The longitudinal system is first formed by modification of the cellular, and then this is again differentiated into the two forms of woody and vascular tissue. Now, in the pine family, this last differentiation has not taken place. So far as its tissues are concerned, therefore, this family should rank below all other flowering plants.

Let us next examine the different classes of plants with respect to the venation of their leaves.

With respect to their venation the leaves of plants are divided into three distinct kinds, viz: the reticulated, or netted veined, the parallel veined, and the dicholomously veined. In the first the veins branch and again run together, forming an inextricable net-work. (Fig. 23, *a*.) In the second the veins run parallel from one end of the leaf to the other, connected only by slender transverse bars, so that the leaf may be torn into parallel ribbons. (Fig. 23, *b*.) In the third the veins branch, but do not run together again. (Fig. 23, *c* and *d*.) The first is characteristic of the *Dicotyledons;* the second of the *Monocotyledons;* and the third of the *Ferns*—perhaps of the vascular *Cryptogams* generally. The leaves of cellular *Cryptogams* are veinless. In this enumeration it will be observed I have not mentioned the *Conifers*. To which class, then, do the leaves of the pine family belong? Undoubtedly to the third. This fact cannot be easily demonstrated upon leaves of ordinary pines, for their cylindrical leaves show no veins, or, if visible, they seem to be parallel. But there are a few broad-leaved *Conifers*, and these always show the dichotomous branching of the veins in the most unmistakable manner. In the *Salisburia*, for instance, we have as beautiful an instance of this mode of branching as can be found among the *Ferns*. The leaves of this *Conifer* are about two or three inches broad, the shape and venation very similar to that represented in Fig. 23, *c*, but much more beautiful. This close alliance in the venation of the leaves between the pines and the ferns is another evidence of the low position of the former among flowering plants. Thus it appears that this remarkable family of plants is allied to the highest *Phænogams*

Fig. 23.



n the general structure of its wood, and to the *Cryptogams* in the 'enation of its leaves. If there was no other evidence we might be in loubt as to its true position; but the simplicity of its reproduction ınd of its tissues settles the question, as it seems to me, forever. There are other points of alliance between pines and club-mosses, which it would lead me too far to notice. In fact this family seems o be, in a remarkable degree, both a connecting and an embryonic ype, and therefore, as we shall presently see, eminently calculated o throw light upon the plants of the coal.

Let us now attempt to apply these principles in the interpretation ıf the plants of the *Coal*, and particularly of the four families already aken as representatives of the flora of this period, viz: the *Ferns*, *Sigillariæ*, *Lepidodendron*, and *Calamites*. We shall confine our attenion principally to the second and third. With reference to the *Ferns* there is little dispute; their unmistakable resemblance to the erns of the present flora leave no doubt as to their affinities. I will ınly remark, in passing, that many of the coal genera of this family eem to have affinities also with the *Cycadæ* and *Coniferæ*. With eference to the other three families the difficulty is much greater; hey are generally supposed, however, to be most nearly allied to the *Lycopodiaceæ* (club-mosses) and the *Equisetaceæ*, (horse-tails;) the *Sigillariæ* and *Lepidodendrons* being considered most nearly allied to he club-mosses, and the *Calamites* to the horse-tails. If so, then we ıre at once struck with the enormous size of the coal plants in comarison with their humble representatives at the present day. *Sigillariæ* and *Lepidodendrons* attained the amazing height of seventy to ıne hundred feet, and a diameter of five to six feet, while the clubnosses of the present day seldom rise to an altitude of more than a ew inches. *Calamites* attain a diameter of fourteen or fifteen inches, ınd a height of thirty to forty feet, while the horse-tails are among ıur humblest plants. This enormous difference in size is sufficient of tself to lead us to suspect that these are not true club-mosses and ıorse-tails. Let us examine them more closely.

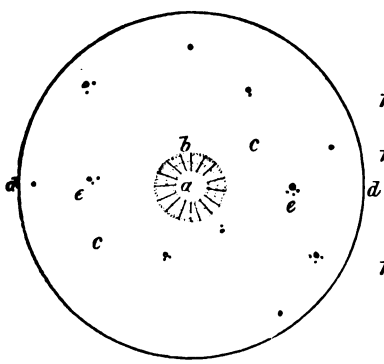
Here you have rude sketches of these families. This is *Sigillaria*. This genus is so little known as to its external appearance that I ıannot represent or speak of it with any confidence. In almost every ıase it is formed as a straight cylindrical trunk, without branches or eaves. So that, although this plant is so common, yet its mode of ıranching and the form of its leaves is still a matter of dispute among ıotanists. In a few cases *Sigillaria* trunks have been found to bifurcate ınd produce long cylindrical branches. In a single, perhaps doubtul, case (*Sig. lepidodendrifolia*) leaves have been found similar to *Lepidodendron*. One of two views seems probable: either that many o-called *Lepidodendrons*, so commonly found in connexion with *Sigillaria*, are the branches of the latter, in which case the branching ınd foliage of this genus are similar to the *Lepidodendron*, or else hat *Sigillaria*, like tree ferns, were generally branchless, and that the arge fronds, (generally supposed to belong to *Ferns*,) which are so ommonly found strewed in profusion about their bases, were their eaves. What I have represented by these sketches are therefore deal restorations on the former hypothesis, rather than actual speci-

mens. You will observe, then, the sparse dichotomous branching, the cylindrical limbs with blunt extremities, so characteristic of the club-moss, but which is found, also, in some species of pines. Like the club-moss, too, the leaves are crowded, pointed, strung along the stem for some distance, but longer, slenderer, and more nearly resembling the leaves of the pine. On this trunk you will observe the seal-like impressions (*sigilla*) characteristic of this family, and from which its name is derived. Also longitudinal depressions running from one end of the trunk to the other, and along which the sigilla are arranged in vertical rows. Thus each trunk of a *Sigillaria* resembled a noble fluted doric column beautifully but variously sculptured the pattern changing with the species. These sigillae are evidently leaf scars, and therefore indicate the leaf arrangement peculiar to this family.

The *Lepidodendron*, of which you have here a drawing, was still more like the club-moss, the crowded leaves being shorter, rhomboidal, and more scale-like, the same long, slender, cylindrical, sparse dichotomous branches. But even here we find an almost equal resemblance to *Conifers*, for it will be recollected that in a large number of *Conifers* as the *Juniperus*, the *Araucaria*, &c., the same rhomboidal, plaited scale-like leaves prevail. The impression of a shoot of an *Araucaria* could scarcely be distinguished from that of some species of club-moss, except by superior size of the former. In its fructification there is the same difficulty, for it is doubtful whether it most nearly resembled the cone of pines, or the cone-like fructification of club-mosses, although the recent investigations of Hooker leave little doubt that the latter is the truer view. All that we know, then, of the external appearance of these families lead us to the conclusion that they were intermediate between pines and club-mosses, and that the *Sigillaria* approached most nearly the pines, and the *Lepidodendrons* most nearly the club-mosses.

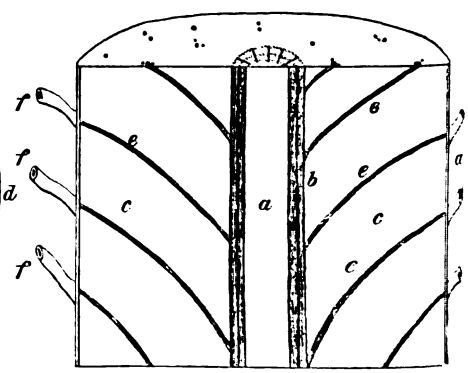
Let us next see what light is thrown upon this subject by examination of the internal structure.

Fig. 24.




Cross section of *Sigillaria:* *a* the pith; *b* the woody cylinder; *c* the cellular tissue; *d* the rind; *e* the bundles of vascular tissue running from central sheath to the leaves.

Fig. 25.




Cross and longitudinal section of *Sigillaria*; letters represent same as in fig. 24; *fff* the leaves.

we make a section of the stem of a *Sigillaria*, (figs 24 and 25,) we externally a *bark*, or, more probably, a *rind*(*a*) of condensed cellu- ;issue, sometimes a half or an inch thick; within this an enormous unt of loose cellular tissue,(c,) often 2 feet or more thick. Through centre of this runs a slender sheath(*b*) of vascular or woody tissue, ;h in a *Sigillaria* 5 feet in diameter is not more than 3 inches in ıeter; a mere thread of vascular in the midst of a mass of cellular ıe. This again incloses a small pith (*a*) which occupies the very re of the trunk. These vascular cylinders, with their inclosed pith, g the most indestructible portion of the trunk, are often found e, and described under the name of *Endogenites*. Figs. 24 and 25 esent cross and longitudinal ideal sections of this plant, (*a*) the ılar tissue of the pith, (*b*) the vascular or woody sheath, (*c*) the ı of cellular tissue between the vascular sheath and (*d*) the rind, lender vascular bundles connecting the leaves with the central th. Upon closer examination of this woody or vascular cylinder ; is found to consist of concentric layers, somewhat analogous to the rs of growth of exogenous trees, and divided into wedges by medul- rays, like the tree exogens. Upon still closer examination, how- , of a good cross section under a microscope (fig. 26) no distinction ıscular and woody tissue, such as is found in the wood of *Dicotylo-* , is observed, but the whole is made up of one kind of tissue, open thin-walled, in comparison with woody tissue proper, but closely nbling the wood of pines. But a longitudinal section shows no like markings such as characterize the wood of *Conifers*, but

Figs. 26 and 27.

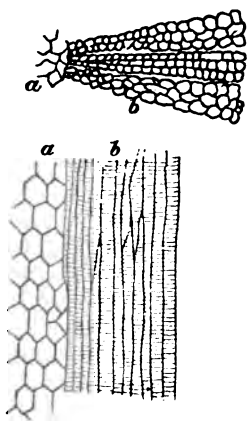



Fig. 28.

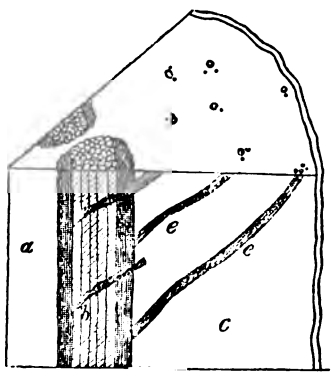



Fig. 28. A cross section and longitudinal section of a *Sigillaria*. The letters *a*, *b*, *c*, *d*, *e* represent same as in previous figs. 1, 2, 3 are the 3 layers of the vascular cylinder *b*, *m* is a medullary ray.

ıls the fact that it consists entirely of spiral vessels, (figs. 27 and ınd that, therefore, the sheath of the *Sigillaria* consists of vascular ;r than of woody tissue. In consequence of the great predomi- ɜ of cellular tissue, these stems, as well as those of the *Lepido- ron* and *Calamites*, are generally found very much flattened by ure.

A cross and longitudinal section of the *Lepidodendron* shows a similar but still less highly organized structure, (figs. 29 and 30.)

Fig. 29.

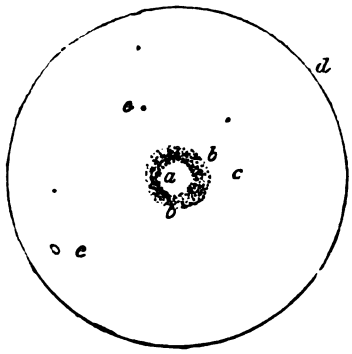
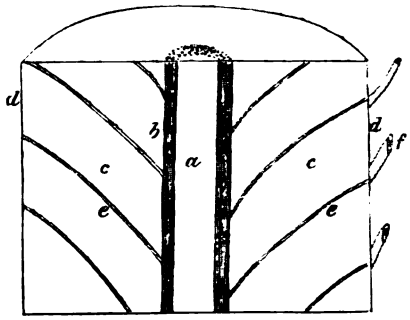



Fig. 30.




The vascular sheath is still smaller, extremely thin, forming on cross section an exceedingly narrow zone. It is moreover not separated into concentric rings nor divided by medullary rays. The cellular tissue both within and without the sheath is very open and loose. The rind (*d*) consists of similar cellular tissue, but more condensed, and there seems to be no line of demarcation, but a gradual transition; in other words, there is apparently no true bark. Here, also, we find long slender bundles of vascular tissue (spiral vessels) connecting the leaves with the central sheath. Microscopic examination of the vascular sheath shows no sign of woody tissue.

*Calamites* we know much less about, but it would seem that in them there is a still greater predominance of cellular tissue, if, indeed, they possessed any vascular tissue at all. They are often found pressed perfectly flat, indicating that they were either hollow, or more probably consisted of a simple rind of condensed cellular tissue, inclosing looser tissue of the same kind. Of this plant, however, we know too little to draw any conclusion as to its affinities.

Now, if we examine by sections a common *Lycopodium*, or club-moss, we find an internal structure closely resembling what we have found in *Sigillaria* and *Lepidodendron*. Externally a thin but tough rind, or epidermis of condensed cellular tissue, inclosing a mass of very loose cellular tissue, through the centre of which runs a slender thread of vascular tissue, sending off in every direction still slenderer threads of the same to the crowded leaves. Upon longitudinal section the vascular tissue is found to be chiefly spiral ducts. The principal difference between this structure and that of the *Lepidodendron* is that the latter has a more perfect pith, and in this respect seems to be allied to the higher order of plants. But I am convinced, from personal examination of the *Lycopodium*, that its vascular thread was the outline of both pith and medullary rays. I call more particular attention to this observation, because, as far as I know, it is new, and as it seems to me calculated to throw much light on the affinities of coal plants.

This very remarkable structure, viz: the existence of a slender central thread of vascular tissue in the midst of a large mass of very loose cellular, does not exist, I believe, among existing plants in the

ıture condition, except in the family of club-mosses. In the embryic state, however, of the *Dicotyledons* we find something similar. we make a cross section of a *Dicotyledon* soon after germination, e., while the first two or three pairs of leaves are expanding, we will ıd a structure very similar to that of the *Lepidodendron*. We find the centre a small pith surrounded by a thin zone of vascular tissue, ıostly spiral vessels,) around this a large mass of cellular tissue, desıed to become partly bark and partly wood, but which is yet neither e nor the other, and the whole inclosed in a thin epidermis of consed cellular tissue.

Thus it appears, both from external and internal examination, that ese families combined the characters of pines and club-mosses. Or we are disposed to attach more importance to their exogenous affinies, and thus to place them among the pines, then we must compare em with the earliest embryonic condition of this class. The true ew, I am convinced, is, that they are both connecting and embryonic pes, or connecting types with embryonic characters. In fact, all ıbryonic types seem to be more or less connecting, and conversely nnecting types, at least in *Palæontology*, are also embryonic. Now, ıat I have said of the *Sigillaria* and *Lepidodendron* is equally true, believe, of other coal plants. I have taken these two because they e better known; but all that is known concerning other genera em to point in the same direction. They all seem to be more or less nnecting types. The *Sphenophyllum*, *Nöggerathia*, and probably any of the so-called *Ferns* of this period are of this character.

Let us inquire now what important conclusions may be drawn from hat we have seen of the affinities of these plants:

1. The distinction of plants into *Cryptogams* and *Phænogams* is nsidered by botanists a fundamental one. Many recent investigaıns, however, have combined to throw some doubt upon the entire stinctness of these classes. The study of the Coal Plants, particurly of the two families *Sigillaria* and *Lepidodendron*, it seems to me ıtirely destroys this as a fundamental division, or, at least, as one at l comparable to the great divisions of the animal kingdom. The nes belong unequivocally to the *Phænogams* and the club-mosses to e *Cryptogams*. If the *Sigillaria* and *Lepidodendron* are connecting ıks between these two families then the classes to which they belong n no longer be considered as fundamentally distinct types or plans structure. The study of animals, both existing and extinct, have nfirmed the wonderful generalization of Cuvier. The four types—*ertebrata*, *Articulata*, *Mollusca*, *and Radiata*—were as distinct during e palæozoic period as now. If such distinct plans of structure ist in the vegetable kingdom at all they have not yet been indicated such by botanists. The distinction into exogen and endogen would em more likely to be fundamental, as this is apparently not a mere stinction of rank or complexity of structure, but of *plan* of strucıre. If so, then we shall probably be able to trace these two types ıwnwards until, overleaping the distinction of *Phænogams* and *ryptogams* as one of complexity of structure only, they reach the wer confines of the vegetable kingdom.

2. We have seen that the plants of the coal are most, if not all of

them, connecting types with embryonic characters. This is not an isolated fact, but one which meets us at every step in the course of our study of the geologic history of the earth. It is but one illustration of a *general law*, a law of the deepest philosophic import, and yet one which is still very imperfectly recognized among geologists. The law may be thus stated: The first introduced animals or plants of any class have been combining types, *i. e.*, have united within themselves the characters of several families, now distinct and even widely separated. Thus the first vertebrates introduced were fishes, but not typical fishes, as we might be led *a priori* to expect, but *Placoids* and *Ganoids*, families which, particularly in their earlier representatives, united with ordinary fish characters others which connected them with the class of reptiles, and even of mammals; and still others which connect them with the embryonic condition of the typical fishes. It is this combination of embryonic characters with others which connect them with the higher classes, this union of high and low characters, which has given rise to all the dispute concerning the position of these families in the scale of Fishes as well as to much of the difference of opinion concerning the law of succession of animals in Geology. Again, the first introduced reptiles, viz: the reptiles found in the old red sandstone and coal, are the most remarkable instances of connecting types of which we have any knowledge. In the first place they seem to have been amphibious, (in the proper sense of the word,) and thus to have connected land animals and water animals, air breathing with water breathing, and all of them united characters, which are now represented by widely separated families. To give a single instance: the carboniferous reptile, recently described by Professor Wyman and exhibited at the last meeting of the Scientific Association at Albany, so remarkably combined characters which are now parcelled out between the three families of *Batrachians*, *Saurians*, and *Ophidians*, that this distinguished comparative anatomist seemed almost at a loss as to which of these families to assign it. He decided, however, that it most nearly resembled a *Salamandroid Batrachian* with characters closely connecting it with the other families already mentioned.

The *Labyrinthodon* of the new red sandstone has been classed by some anatomists with *Batrachians*, and by others with crocodiles. There seems yet a doubt whether it should be called a tailless crocodile or a crawling frog with crocodilian teeth. The huge *Saurians* of the secondary period combined reptilian with fish, and even some mammalian characters. Even in the tertiary period and in the introduction of the highest animals this law is not forgotten. The recent investigations of Professor Owen have shown that the first introduced *Pachyderms* were not typical *Pachyderms*, but that they combined the characters of *Pachyderms* and *Ruminants* to such a degree that it is almost impossible to assign them with certainty to one or the other order. In fact, the study of these extinct forms has led this great anatomist to class the *Pachyderms* and *Ruminants* together as subdivisions of one and the same order.

Thus in every case in the earliest faunæ and floræ one class stood for many. The earliest families combined the characters of several

nilies or classes, and stood as their representative until these famis or classes were separately introduced. The *Placoids* and *Ganoids*, instance, stood during almost the whole palæozoic period the sole ɔresentatives of the vertebrate type, combining in themselves the aracters of all classes, and thus prophesying their coming, until ıture was fully prepared for their introduction. The *Sigillaria* and *pidodendron* stood as the representatives of both *Cryptogam* and *ıænogam*, until these two *ideas* were separately and more distinctly pressed by the subsequent introduction of the typical forms of these o classes. It is as if Nature first sketched out her work in general ·ms and then elaborated each subordinate idea in separate families; these families, taken together as an organic whole, still containing ɜ original idea in a more completely developed form, as if the proɜm of organic nature was first expressed in a few simple but comɜhensive symbols and then differentiated. Organic nature has en been compared to a *broken chain*, the disjointed links of which ɜ the widely separated and distinctly marked families of the present ına and flora, and the connecting links of which are to be found ep buried in the strata of the earth. But the complexity, the auty, and, more than all, the life, growth, and development of Nare, is not to be represented by any such miserable mechanical convance as a chain. It is rather a *tree*—a tree of life—a tree whose ınk is deeply rooted in the lowest palæozoic strata, whose first ınt arms are given off in the carboniferous, which branch again in e secondary and again in the tertiary periods, while its extreme anchlets, and also its flower and fruit, are the fauna and flora of the esent epoch. The object of geology is to trace each branch to its low branch, and each limb to its fellow limb, and thus gradually to ıtore the whole noble form and determine the laws of its growth.

This differentiation, this passing from simplicity to complexity, ɔm unity through diversity to a higher unity, is the fundamental w of development. Let me illustrate my meaning by a few simple amples: The ultimate anatomical elements of every organized body, ıether animal or vegetable, are cells. The whole body is made up cells, and all the bodily functions are performed by cells. In fact, e body may be looked upon as an organized community of indiıual cells. Now, if we trace these cells from their earliest condition the embryo to their mature condition in the fully developed animal plant, or from the lowest animal or plant regularly to the top of e scale, we will observe a most beautiful instance of the differenıtion of which I speak. The cells are at first all alike, simple and obular, and each performs all the functions appertaining to cells, ough comparatively imperfectly. But as development advances the lls begin to take on different forms and to perform different funcɔns. Some become nervous cells, some muscular cells, some biliary lls, &c., until, in the mature condition and in the highest animals, e diversity of form and specialization of function reaches the highest int, each form of cell being confined to the performance of a single nction.

If, instead of the ultimate anatomical elements, the cells, we take e proximate anatomical elements, the organs, or even the regions of

the body, still the same differentiation of form and specialization of fuction is observable as we pass from the embryonic to the mature condition, or from the lowest to the highest animals. I might give many other examples taken from the organic kingdom. I will give but one other example, and that taken from a still higher kingdom. Human society is also an organized body, the ultimate anatomical elements of which are individuals. Now, in the earliest conditions of human society we find these elements, so far as their social functions are concerned, identical. Each man performs all the social functions apertaining to man. He is his own tailor, shoemaker, agriculturist, scientific man, &c. But in proportion as society advances in the same proportion does specialization of social functions advance, until, if we could conceive of a society perfectly organized on a purely material basis, *i. e.* according to the French material philosophy, then the social function of each individual would be reduced to the narrowest possible limits. This is only impossible or undesirable on account of man's moral and spiritual nature. Still it is no less evident that, in so far as human society is a *material organization*, specialization of function, differentiation is the law of development.

Now, it will be recollected that in the geological history of animals and plants we have everywhere found the same differentiation of form and specialization of function. As in the history of the animal body, one cell form in the embryo was the representative of many widely separated cell forms in the mature animal; so also in the geological history of that greater and more complex organism, the animal and vegetable kingdom, one form in the early periods stood as the representative of many widely separated forms in its present mature condition. Am I not justified, then, in saying that the great law which has governed the introduction of successive animal and vegetable species is that of gradual development of the animal and vegetable kingdom as an *organic whole?*

It seems to me that all the dispute and misunderstanding on this subject have been the result of too narrow a view, have arisen from fixing the mind upon genera and species instead of upon the larger divisions of classes and orders, upon the individual elements instead of the organic whole. Development does not necessarily involve the idea of progression in all the individual elements. In the differentiation of the cells of the living body, of the individuals of an advancing community, or of the forms of an advancing fauna, the whole organism progresses, but as a necessary result of differentiation, while the highest individuals are successively higher and higher, the lowest, considered in themselves, and not as parts of an organized whole, *may become lower.* Certainly the difference between the high and the low becomes constantly greater. It should not surprise us, then, that some of the lowest forms of animal life have been among the latest introduced. It is precisely what, according to a true appreciation of the law of development, we should be naturally led to expect.

Mr. Hugh Miller, the eminent Scotch geologist, in his admirable work, "*Footprints of the Creator,*" by taking too limited a view of this subject, has been led, if not into error, at least into a statement of views which has misled many. In his zeal against the Lamarck-

ian theorists, and more particularly against the author of the "Vestiges of Creation," he has attempted to show that, in certain families, at least, the law has been that of degradation, instead of progression. He has labored to prove that the earliest fishes have been the highest, instead of the lowest fishes, and that the earliest reptiles have been higher in the scale than the present reptiles. This idea has been seized upon by some in this country, and it has been attempted, by connecting it with the fall and degradation of man, to show that the universal law of history, both geological and human, is degradation. The disciples of this melancholy philosophy believe that divine power successively introduced higher and higher classes, but each class, left to its own laws, continued to degrade itself. The Deity repeatedly attempted progression, by the miraculous introduction of successively higher classes, but some malign influence as constantly interposed and, to some extent, frustrated these attempts.

Now, it is evident that these theorizers have never thoroughly grasped the fundamental idea of development. They mistake *specialization* for *degradation*. Upon this theory all our boasted modern civilization, so far as it is the result of division of labor, specialization of social functions, and mutual dependence of parts, is degradation.

Upon what ground are the *Ganoids* and *Placoids* considered the highest fishes? Only on the ground that they combine with their fish characters others which ally them with the higher classes, particularly with reptiles. In other words, they fall into the very error of the Lamarckians themselves, viz: that of supposing that the animal kingdom is to be represented by a *linear series*, and that, therefore, the highest fishes approach the lowest reptiles, and the highest reptiles the next higher class, &c. But the very reverse of this is the fact. The animal kingdom should be represented by an infinitely branching tree, rather than by an ascending right line; for we find, in every case, classes approach each other in the lowest members of each, and diverge as they ascend. Thus, it is the lowest, and not the highest plants, which approach the animal kingdom. As we ascend, they become more and more widely separated, until, in the highest representatives of each, the separation reaches its highest point. So also each branch of these kingdoms diverges from its fellow branches. It is, therefore, in its lowest, not its highest, members that we should naturally expect, according to the law of differentiation, the class of fishes to approach the class of reptiles. In some sense, indeed, *Placoids* and *Ganoids* may be considered higher than typical fishes. Their brain and nervous system is more highly organized, their reproduction is more complex, their young are better cared for. But it will be recollected that they are both connecting and embryonic types. Now, it is their connecting characters which seem to elevate them, for their true fish characters are all *embryonic*. As *vertebrates* they may possibly be considered higher than other fishes, but as fishes they must be considered low. Anatomists may place them high but morphologists will always place them low. If the several classes of the animal kingdom, diverging in various directions, be, as it were, projected upon a vertical plane, the *Placoids* and *Ganoids* may possibly occupy a higher position than the typical fishes; but,

in such a rectilinear projection, all the variety and beauty of nature is lost. It is evident that, for purposes of classification, the morphologist is right; for if the principle of the anatomists is consistently carried out, no classification is possible, for animals the most diverse, an echinoderm and a fish, may be brought together. The Divine classifier, in the introduction of species, has followed the principle of the morphologist.

Geology, then, teaches, and, as it seems to me, unmistakably teaches, that the law of succession of animals and plants is that of progressive development in time of these two kingdoms. But, although there has been a development, it is not the development of the Lamarckian, of the author of the Vestiges of Creation, and the pantheist. The development which geology teaches is not a development which is the result of physical laws and physical forces. If there is anything which geology teaches with clearness, it is that the animal and vegetable kingdoms *did not commence as monads*, or vital points, but as organisms so perfect that even the maddest Lamarckian must admit that they could not have been formed by agency of physical forces; that species *did not pass into one another by transmutation*, but that each species was introduced in full perfection, remained unchanged during the term of their existence, and died in full perfection; that physical conditions cannot change one species into another, but that a species will give up its life rather than its specific character. In passing from the equator to the poles we pass from one geographical fauna to another, from one set of species to another, but observe no transmutation, but only substitutions; so also in passing from the oldest geological to the present fauna we pass from one set of species to another; not, however, by transmutation, but always by substitution. This has been repeated so many thousand times in the geological history of the earth that there is no room for doubt on the subject. As far as the evidence of geology extends, *each species was introduced by the direct miraculous interference of a personal intelligence.* There has, indeed, been a constantly increasing series, but the connexion between the terms of the series has not been physical or genetic, but intellectual; not founded in the laws of reproduction, but in the eternal counsels of the Almighty. There has, indeed, been a development, but not a development the force of which exists within the thing developing; but rather the development of a great work of art, under the hand of the Divine Artist—a work conceived in eternity, and elaborated throughout all time. What an overwhelming idea this thought gives us of the unchangeableness, the all-comprehensive intelligence and foreknowledge of the Deity! The infinite diversity of nature, the whole idea of this infinite work of art, was contained in the first strokes of the Great Artist's pencil, and the ceaseless activity of Deity has been exercised only in the eternal unfolding of the original conception.

# CTURE ON THE VASTNESS OF THE VISIBLE CREATION.

BY PROFESSOR STEPHEN ALEXANDER, OF THE COLLEGE OF NEW JERSEY.

[y object on this occasion is, in itself, a very simple one. I desire to : some illustrations of the vastness of the visible creation, as made wn by modern astronomy. I say emphatically modern astronomy, some knowledge of this science is probably nearly as old as world itself. Almost from the first issuing of the great decree ; the sun and moon should serve for signs, and for seasons, and for s, and for years, men have been careful to observe the heavens; the Great Creator had so written that decree upon the heavens nselves that men have not been slow to read the lesson thus visi- inculcated. I would observe, moreover, that the objects of astro- ıical research, with very trifling exceptions, are, of all others, with ch we have to do, the most unalterable. It is almost exactly true : the very constellations which we now see were gazed upon by the :deluvian patriarchs; were in full view of Noah when the great d of waters was upon the earth; met the upturned eye of Abraham ın he was led out by Divine command to behold in them the sym- of the promise; guided the ancient Greeks in navigation, and . serve the modern astronomer as so many guide-points in the vens.

[y purpose, as already indicated, is to illustrate, not to demonstrate. ıccomplish the latter in a single lecture would not be practicable; certainly of astronomy, above all other sciences, it is true that it r throw itself on its character for veracity when it requests that its :lusions should be received as reliable. A science which can trace ımet in its course, where no eye has had even a telescopic view of ır three-quarters of a century, and bring it back by computation ectly almost to a day, or which can predict an eclipse a century ce as readily as one that will occur this year, and to whose accu- r experience throughout bears such abundant testimony—such a nce may fearlessly throw itself on its character for veracity. Be- I proceed, however, to elucidate the subject, let me call attention a moment to an old-fashioned problem, whose bearings upon the ıect will, I trust, be presently seen. I allude to the problem of the e of a horse, in which a farthing was allowed for the first nail in his :s, two for the second, four for the third, and so on. There were ty-two nails in all, and yet, from the small beginning of a farthing, ng to this doubling thirty-one times, the value of the horse was only ıe computed in millions of pounds. Now, with reference to the ıect of astronomy, we shall have occasion to see that, though com- ıcing with a comparatively moderate unit, we shall advance upon milar plan, but much more rapidly. Keeping, then, in view the stration already given, you will at once see how gigantic, after a r few steps, must be the last result compared with the first. Our t object to-night will be to gain some idea of the size of the earth lf, on which we stand. The half diameter of the earth is the

measuring unit with which to compare the distance of the earth from the sun, and thus obtain a new unit with which afterwards to compare the distances of the other planets. To give a just idea of the size of the earth we will avail ourselves of the largest tangible measure attainable, that is, the highest mountain on the earth's surface. The highest mountains are the Himalayas, their altitude being five and a half miles. Now, we do not exaggerate when we say that, if we could uncover the base of one of those mountains, it would cover four times the original area of the District of Columbia, or the surface of one of the ordinary counties of our States, rising above that surface to the height of five and a half miles, about equal to the height of Chimborazo added to that of the highest of the Alps. This shall be our standard of comparison with regard to the magnitude of the earth. Such a mountain is rather more than $\frac{1}{1440}$ of the earth's diameter or about $\frac{1}{720}$ of its radius. In making the comparison, after the ordinary mode, two difficulties present themselves. It is said that, if you represent the earth by a globe, the highest mountain on its surface may be represented by a small grain of sand. You thus proceed from the greater to the less, whereas, in nature, we must proceed from the less to the greater. Besides, a grain of sand is too small to give an adequate idea of the matter to be illustrated. To avoid this we shall make use of a scale sufficiently large to present the mountain distinctly, and shall proceed in the natural order from the less to the greater. This diagram before me is thirty-nine feet six inches in length, and is intended to represent two radii of the earth opening to the extent of one degree. At the further end of it is a blue band, representing the atmosphere, and immediately beneath which is a small row of mountains. Their heights, on this scale, is a trifle less than two-thirds of an inch, and their actual height, as compared with the real half diameter of the earth, is as two-thirds of an inch compared with thirty-nine and a half feet, and doubling the half diameter we shall have the ratio of two-thirds of an inch to seventy-nine feet. Below the row of mountains you have a dark blue band, representing the ocean. Below that again a darker portion still, representing that portion of the earth's crust through which you must go to find a red heat, and beyond that you have the red color continued until it passes into whiteness; it indicates the depth at which we would probably arrive at a white heat.

[It would be impossible, in a wood-cut, to do justice to the illustration here explained by the lecturer. The explanation itself will doubtless be sufficient.]

The diameter of the earth is, then, a very large unit in comparison with the height of the highest mountain. The circumference, of course, is more than three times the diameter. If you should attempt to walk around the earth at the rate of twenty miles a day, three years and five months would be spent in completing the circuit; and if you should fly around it at the rate at which the steam car travels, say thirty miles an hour, you would accomplish its circuit in thirty-four and a half days; but, if its circumference be great in comparison with ordinary standards, its surface in comparison with that of a sphere of ordinary size must be still more enormous. The illustrations, I would

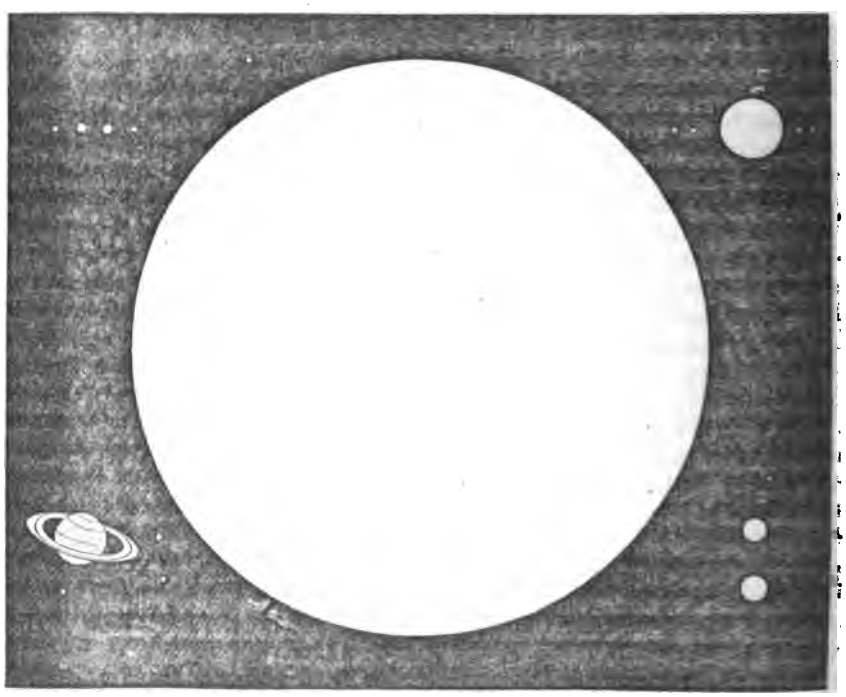
remark, that I give you here, are most of them originally devised, and the results in all cases verified by actual computation. We could not pass over the surface of the earth and take a good look at the surface at a more rapid rate than that of twenty square miles a day, and yet this would occupy us a period of 27,000 years. To view that portion of the earth which is inhabited, if we should estimate it at but one-fourth of the whole, would, at the same rate of progress, require 6,750 years; or to view the habitable portion of the surface of the earth would require, in the case of the same individual, provided he could live so long, more than the time from the creation of man down to the present day to walk. If the surface of the earth be so large, its capacity, of course, compared with an ordinary standard, will be found to be to it in a still greater ratio. The largest tangible measure, as I have said, is the largest mountain on the earth's surface. Suppose such a mountain to be regularly shaped, and to have a diameter of twenty miles at the base, it would then contain 576 cubic or solid miles of material. Make use of that huge body as the unit of measurement of the bulk of the earth, and the bulk of the earth would contain it 450,000,000 of times, and even more. How can we appreciate so large a number? We find it even difficult to form an idea how large a number a million is; we may obtain some idea of the vastness of numbers, such as those in question, by ascertaining the time required to count them. If, then, you should count at the rate of two per second, continuing the work for eight hours a day, twenty-one years and five months would be spent in counting the number which expresses the bulk of the earth in comparison with that of the mountain. Perhaps I do not exaggerate the matter when I say, that the most accurate idea of a bulk so vast may be obtained by regarding the image which we frame to ourselves when we attempt to form an idea of infinite space. As we cannot grasp infinity this image must have a dim and misty outline; but it may be that it approaches more nearly than anything else to presenting an adequate idea of the actual size of the earth.

Having obtained some idea of the size of the earth let us proceed a step further, not in the way of doubling, but much faster. In so doing we next notice the distance of the earth from the moon, which is represented here on a much smaller scale than that employed in our first figure. The distance from the centre of the earth to the centre of the moon is about sixty radii, or thirty diameters of the earth. The magnificent appendage of Saturn compares very well in size with this, its diameter being about twenty times that of the earth. We pass from this to the diameter of the sun, which is about one hundred and twelve times that of the earth, and, of course, the surface is more than ten thousand times the surface of the earth. The scale we have at first adopted we should find to be inadequate to compare the earth with the sun. No ordinary apartment could contain the necessary illustration. The scale has therefore been reduced a thousand times, instead of being that of a hundred miles to a foot. This diagram is constituted on a scale of 100,000 miles to a foot. On it the earth has shrunk down to $\frac{24}{100}$ of an inch in diameter. This, then, [pointing to the figure,] is the relative size of the sun, 112 diameters of the earth being equal to the diameter of the sun. The liveliest imagination, however exer-

cised, can form no adequate idea of the size of this magnificent luminary of the day. Its surface occupies an area greater than that of twice ten thousand oceans, each larger than the Pacific. And this surface is tossed into waves of intense brilliancy, beneath which the Himalayas would be buried and "melt with fervent heat;" and whether we regard him as issuing from the chambers of the east, he commences like a giant to run his course; or whether in unveiled meridian splendor, he almost seems to pause a moment to gaze upon a world rejoicing in his presence, or enwrapped in robes of surpassing magnificence he sinks to rest at night; under any and all these points of view, he is at once the fitting representative and chosen emblem of all that is good and beautiful.

From the size of the sun we proceed, in the next place, to that of the diameter of the earth's orbit. But I would observe, in passing, that the relative size of most of the planets is represented in this diagram. Thus, we have that of Mercury, Venus, Mars, Jupiter, Saturn, &c. The moon is represented by a ball, the size of a pea, at

1. 2. 3. 4. 5. 6.



Upper line—1 Mercury. 2. Venus. 3. Earth. 4. Mars. 5. Moon. 6. Jupiter.
Lower line—7. Saturn and the three largest of his satellites. 8. Uranus, with the two large satellites. 9. Neptune, with his satellites.

the place to which I now point, almost touching the sun. That represents the comparative size of the moon. The distance from the centre to the surface of the sun is one and two-thirds the distance of the moon from the earth, which itself is thirty diameters of the earth.

The distance of the earth from the sun is about 12,000 diameters of the earth, or, if we proceed in the other way, multiplying the ast unit, we shall find it to be 107 diameters of the sun, vast as is hat body in extent. To travel this distance at the rate of thirty niles an hour, going on continually, would occupy three hundred ınd sixty two years and seven months; and merely to count it at ıt the rate already mentioned, that of two per second for eight ıours of every day, would fully occupy four and a half years; ınd yet more than three times this distance the earth travels every 'ear. To turn around but once in a year requires but a very slow ıngular motion. Imagine the hand of a dial-plate to turn around ınly once in a year, how large the dial-plate must be in order that we night see the motion at all; yet in completing its circuit the earth ravels at the rate of nineteen miles per second; or, while I deiberately say to you, it moves, we are borne nineteen miles. This esult cannot be in error by more than its two hundred and thirtyecond part. When nearest to the sun, which is about the last of December, we travel about three-tenths of a mile per second faster han this, and about the first of July three-tenths of a mile slower. Even this excess of velocity is fearful. Who could think of being onveyed, mechanically, over the surface of the earth at the rate of hree-tenths of a mile per second.

We are now compelled again to reduce our scale, and, instead of one, ne hundred thousand miles to the foot, make use of one, two hundred nillions of miles to a foot; and thus the sun, though magnificent in omparison with the earth, shrinks down and becomes no larger han the head of a pin. The orbit of the earth is represented by a 'hite curve, to which the rod now points. Here we have the disurbed regions of the smaller planets, and there we have portions of hat of Uranus and the most remote of the known planets, Neptune. This long and complete curve is the orbit of Halley's comet. The istance of the earth from the sun being now taken as our unit, the istance of Neptune will be thirty times that, or thirty times ninetyive million miles. Of course, to travel it at thirty miles per day ontinuously would occupy about ten thousand eight hundred and eventy-five years. Five distances of the earth from the sun from he place of Neptune would carry you to the end of the orbit of Haley's comet. The distance from this, again, to the nearest star is, we ıad almost said, a void of immense extent compared, with that 'hich we have already had to do. It is scarcely worth while to reard miles at all in speaking of the distance of a star; the number ecomes so large that we cannot grasp it. We may, however, obtain speaking illustration of the enormous distance of the nearest of the ixed stars by ascertaining what must represent it in comparison with he small globe which I hold in my hand, which has a diameter of hree inches. We must despair any more of illustrating distances so 'ast by any picture, however large. We are not about to deal in magıificent oriental fiction, but with ascertained facts. Let this globe repesent the earth; then one hundred and seventeen thousand five hunlred miles will represent the distance of the nearest fixed star.

It is useless, almost, to state how long it would take to count

star must be very intense, for even when highly magnified
telescope, so that its light is enfeebled, it yet shines brightly, th
appearing nearly as a mere point; and if the light of it is refl
light why do we not see the body that illuminates the star? \
is that body? It cannot be the sun, because, even at the very mod
distance of the planets, it becomes very feeble; if, then, we c
suppose the light coming from the stars to be reflected light
would be at a loss to discover the luminous body that shines
them. But it has been ascertained, by careful experiment, that
light of the very brightest fixed star, Sirius or the Dog star, wl
if the night were clear, my audience might see as they passed o
the lecture room—we say it has been ascertained that the actual
emitted by this star, (with quite a probable allowance for dista
is full sixty-three times that of our sun; such is not always
case, as some stars do not give quite as much light as the sun.
it is true, notwithstanding, that if many of the stars are not suns
are more. It is unnecessary to contend about the name, for you
either call them suns or invent a name which shall mean a la
thing. When we make the statement that all the fixed stars are s
are we aware of the sublimity involved in that statement? I un
took to show my audience, as well as I could, a short time ago,
constituted a single sun; but it is also true that the tiny ray w
gladdens our eye, as shooting from some twinkling star, it trembl
the casement; it is true that this is a miniature sunbeam, and
faint and feeble glow of starlight, which sometimes, like a s
transparent veil, covers the fair face of nature is woven of
scattered glory of thousands of suns. In the very fact that it is
but faint and feeble we have the most speaking illustration of
awful distance; when we arrive at such a distance as this, it bec
quite evident that such a unit as the earth's distance from the s
altogether too small. The distance of the earth from the sun mu

van in 9½ years; from Arcturus in 26 years; from the Polar star in 3 years; and from Capella in 70¾ years; or Capella, the beautiful star the Goat, is seen by the light which left it nearly three-quarters of century ago, and has been travelling at the rate of one hundred nd ninety-two thousand miles per second during the whole of that terval.

Let us next notice the combinations of the stars. It is a very rious circumstance, to say the least, that wherever we direct the lescope to the heavens we shall find the stars combined in pairs; nd so frequently does this combination occur that we cannot regard as the result of accidental position. It is true that when two stars re almost one behind the other they might not appear to be very far part, though really at very different distances from us; but by careful easurement, in some cases, it has been ascertained that they are ally, as well as apparently, near. In fact they are connected together, and revolve around each other, as is the case with the earth nd sun. We have here represented two or three such double stars. here is one in Gemini; also one in Scorpio, one of the two stars eing blue and the other yellow. The blue star does not show well, nless in a very good light; but the representation is therefore the ore true to nature, the sky being itself so blue that it is more difficult to see such a star. Red and yellow stars are also of frequent ccurrence; and in the case of the beautiful star in Andromeda, the wo individual stars are, the one rose color, and the other green; the olors of the double stars are complementary, or such as, when combined together, form a white light, the star appearing white and ngle to the bare eye. We can perceive something extremely elegant n the arrangement if planets should circulate around these red or reen suns; then a red or a green light would be seen as long as it lone were visible; but a white light, when both suns were above the orizon, poetic fancy never sketched anything more sublimely elegant han this combination of tinted suns, these parti-colored gems which parkle in the diadem which surrounds the dark brow of night.

We come now to a more extensive combination of stars. We cannot ook at the sky with any sort of attention even once without perceiving n amazing collection of the stars in the direction of one single great and or girdle. This constitutes what is called the milky way. hroughout one half of its circuit it is divided into at least two parts. Most of the stars in heaven are situated in one part, and in the other ortions of the sky the stars are comparatively sparse. The attempt as made by Sir William Herschel to ascertain the relative distance the fixed stars before the actual distance of any of them was determined. Some idea may be formed of this by ascertaining how many ore can be seen in one direction rather than another, as we might dge of the extent of a crowded audience in one direction rather than another, by ascertaining how many could be seen in the one and in e other direction. A better method of sounding the heavens, as it was lled, consisted in using successively telescopes of greater and greater ace-penetrating power. The space-penetrating power may be ascerned by comparing the brightness of the beam of light emitted by a escope with that seen by the bare eye. The science of optics will ddily enable us to ascertain that. Then, if we bear in mind that light

at twice the distance is four times as feeble, &c., it will be seen that a telescope which would increase the intensity of light to four times that of the light seen by the bare eye might enable us to see twice as far, &c.

By making use of a telescope of a greater and greater space-penetrating power Sir William Herschel, in investigating portions of the milky way, continued to see new stars up to the twenty-eighth order of distance. The borders of the milky way are supposed to be at the nine hundredth order of distance. If this be so the time of the arrival of light from the borders of the milky way must not be measured by a single year, but by centuries; in fact, so far as we may rely on the conclusions of Dr. Mädler, the distance of the centre of this our group from us, as thus estimated, is 537 years. He concludes, moreover, that the stars in the milky way and our sun with them revolve at the rate of once in about eighteen million years. Whether we regard this as accurately ascertained or not, very certain it is that the sun and all planets are moving in the regions of space.

The researches of Herschel, Argelander, Struve, and others, have all contributed to point out very accurately a single spot in the heavens, towards which we are incessantly travelling by a motion very slow when we consider the magnitude of the orbit, the distance travelled being about four-fifths of the diameter of the earth's orbit every year. When we scrutinize the outskirts of the milky way and attempt to see beyond it, we find what seems to be an entirely detached combination of stars. If what we see in them be stars only about the size of those in the milky way we might readily conclude that they were at no greater distance; but it may be that what are apparently single stars are themselves combinations. These groups are called clusters. This is the representation of a coarse cluster. We find others much more closely arranged, as in the figure, where they are represented by a white, powdery substance. The stars near the centre are not to be counted by hundreds. When clusters become so remote that you cannot make out the individual stars you may still discern clusters of a granular shape and appearance in their structure; or that they are made up of a "star dust," an expression sublime from its very simplicity. In this *quasi* crystalline mass the molecules are double stars, the ultimate particles are suns, and the atoms, if any, are planets. If the cluster be a globular one it may also be true that all the stars, the outer ones only excepted, are revolving around the centre in the self-same time. Beyond these still are the nebulæ, some of which the most powerful telescopes have failed to resolve; that is, have failed to show that they are made up of stars. In other cases they are found to be made up of stars, and resolvable. We cannot positively assert that there is no cloudy-looking substance existing in the heavens which is not made up in this way; some appearances, surrounding stars, cannot as yet be resolved. Other whole nebulæ cannot yet be resolved by telescopes of large space-penetrating power. Some idea of the distance of a nebula not resolvable may be obtained by ascertaining the space-penetrating power which will cause that nebula to present the appearance put on by another before power sufficient was applied to resolve it; and thus, comparing the powers employed in the two cases, we arrive at a distance so great as that a comparison by means of the velocity of light itself becomes almost

inadequate. Even light, (which could we thus curb its motion would girdle the earth in a twinkling,) which rebounds to us from the moon in a second and a quarter, and which, springing from its home in the sun, visits the most distant of the known planets and returns in less than a day, even this swiftly flying messenger, borne upon the very wings of the morning, can only reach us from those remote bounds after the lapse of centuries. Admitting all this to be true, then, although an accurate result is here no longer possible, there is a reasonable probability that the sublime idea presented by Huygens is itself a fact; that some of these bodies are so remote that the light by which we see them must have left them before the creation of man. There is something almost awful in the thought of our having arrived at a reasonable probability that we see these objects as they were before the race of man had being; to behold, as it were, the record of eternity past, unrolled to be read in time. We are compelled to view them from such a distance looking towards them; but in imagination we may place ourselves at the other extremity of the line thus defined, then the light from the earth and solar system would have been as long in reaching that position as the light from the other way has been in reaching us; and if we had the optical power and could look down upon the earth, then the mastodon, which is now a mere fossil in our cabinets, would be seen as the living, moving, breathing mastodon. The fact, in more general terms, is this: There are portions of the universe through which the visible record of very much that is great and awful that has been transacted here is still travelling through the regions of space, and might be discerned by a being provided with sufficient optical power. I think it necessary to notice but one thing more. The fixed stars are not merely like the sun in the intensity of their light, but, it would also seem, in revolving around their axes. We ascertain that the sun revolves around its axis by noticing the spots on its surface. When there are many spots towards us the light of the sun must be enfeebled, sometimes even sensibly so. There are variable stars that periodically become dim and then again resume their former brightness. The natural solution of this fact is that these stars are like the sun, not merely in their light, but also in the way in which that light is produced. Perhaps upon their surface there are spots which, when turned towards us, cause their light to become dim, and when away from us there is an increase of brightness. There are stars also which may be called temporary stars; for after appearing in the heavens a brief period they become seemingly very small or they disappear altogether, a fact which can hardly well be accounted for, except by the supposition that there has been a real physical change in the body itself. In undergoing these changes, changes in color have also been manifest, so great that we may suppose that there has been a combustion or partial destruction of the body in question. The star seen by Anshelm in 1670 was of the third magnitude, passed through great fluctuations of light for two years, and then became either excessively small or quite invisible. There are, moreover, lost stars, whose places are now vacant, though some of them have been recently observed. When we look at these strange fluctuations we may suppose that something like combustion has taken place, or that, for the

time being, its power of giving light has been suspended. In reviewing these facts it appears difficult not to conclude that here was a world whose destiny was, for the time being, completed, and the fitful glare of whose gorgeous funeral pile shooting across almost the vast distance which separates us came with undiminished velocity to tell us the tale that once it was. However this may be, we certainly know that He who, "by His strength, setteth fast the mountains, being girded with power," hath also "of old laid the foundation of the earth, and the heavens are the work of his hands. They shall perish but He shall endure; yea, all of them shall wax old, like a garment, and as a vesture shall He change them, and they shall be changed; but He is the same and his years shall have no end;" for "He inhabiteth eternity and the praises thereof."

# METEOROLOGY.

COMMUNICATION FROM A. FENDLER.

COLONIA TOVAR, VENEZUELA, SOUTH AMERICA,
*August* 5, 1856.

ıR SIR: I sailed from Philadelphia on the 5th of May, and
:d at Laguayra three weeks after. Colonia Tovar I reached on
:h of June, and commenced my meteorological observations on
)th. The barometer and the dry and wet bulb thermometers,
ı by your kindness I received from Mr. Green, I have brought
safe and in good order.

:ompanying this I send you two registers of meteorological ob-
tions of the month of June and July, 1856; and here I have to
the following remarks:

As I am very much interested in the results of the observations,
l not say that I pay the most particular care and attention to
:ondition of the instruments, as well as to the nicety in taking
vations and in noting them down.

The column under the head of "Barometer height reduced to
ıng point," I could not fill up for want of the necessary tables.
By comparing my old thermometer, which is one of the more
ıon kinds, marked "T. Barry, London," with the Smithsonian
ulb thermometer, I found that the former is from one and a half
e degrees too high; so that I was obliged to use the dry bulb of
sychrometer also as thermometer in the open air. The wet bulb
therefore exposed to the open air also. According to the first
:iples of evaporation it is, however, evident that the more rapid
ıotion of air is which touches the wet bulb the more energetic
be the evaporation of the water contained in the wet linen, and
lower will the mercury sink. This I found to be confirmed by
ı breeze, and even the lightest breath of wind that happened to
e the wet bulb at the time I took observations. I therefore regard
bservations with the psychrometer, that are not taken in a calm
ısphere, or in an atmosphere the velocity of which at the time of
:vation is known, as of little value.

ı I had no other standard thermometer besides the dry and wet
, I can give the psychrometrical observations only, with the re-
ı that they are worth just as much as all other such observations
ɜ in the open air without regard to the currents of the atmo-
re. In future I shall try to shelter the wet bulb against the
ence of wind at the time of observation.

As I have no rain gage I can only put down the time of be-
ing and ending of rain.

With regard to clouds I may say, that the higher clouds are
:ly hidden from view by the masses of lower clouds, so that the
se of the former can very seldom be ascertained in the rainy
ɔn, and, when seen, there are several strata, one above the other.
ead of the higher clouds, I have carefully noticed and put down

the course of the *lower* clouds, under the head of "winds." The motion of these lower clouds may justly be said to indicate the real course of the wind; for in such a mountainous country as this the atmosphere at the bottom of the kettle-shaped valley of the colony, is set in motion by a great number of local causes, and this motion is changed and modified by the many ravines and watercourses, and by every slope of the irregularly shaped mountains. The colony is surrounded by mountain ridges, crowned by several peaks. These barriers open only in one direction, towards the east, where they form an outlet for the river Tuy, which has its sources in the neighboring fields and adjacent forests. In such a region as this it is next to impossible to note, even in *one* narrow district, all the different little breaths and jerks of wind, which frequently change every moment.

As to the motion of the lower clouds, they frequently showed a velocity which I estimated at about 7 miles per hour; and as there is no number corresponding to this velocity in the tables, I introduced the number "2½," which means 7 miles per hour.

Fog is a considerable item in this region in the rainy season, and I have accordingly noted it down under the head of "kinds of clouds."

Thunder and lightning are very rare here, and when they occur they make so little show that, with regard to force, they may be compared to those of the United States as the zephyr to a strong gale. In the register I have noted them down in the margin.

Tornadoes I have never seen in the colony, not even a gale of wind, within the two and a half years that I have been living here. Hail storms are unknown in this part of the country.

Of the 48 observations recorded in July, at 7 a. m. and 2 p. m., on the course of the lower clouds, 10 are E., 15 E.SE., and 15 SE., which shows the prevailing winds to be between E. and SE. Their mean velocity is a fraction over four miles per hour.

Of rain, fog, mist, and clouds, we had more than a sufficiency, the mean cloudiness being 6.4.

The weather has been so unfavorable since my return from the States that I have not yet measured any of the neighboring heights and passes by barometer.

The thermometer in the open air shows a mean temperature of 58.3 for the month of July, a rather low temperature for the height of 6,500 feet in latitude 10° 26′. The minimum of the month was 54°, the maximum 69°.

I also inclose the half-hourly and hourly barometrical observations for seven days, made in order to ascertain the hour of maximum and minimum of the daily periodical variations. And here I found that these variations within the tropics, at least at the colony, are not so regular as we sometimes find stated in books. As, for instance, the following: "Such is the regularity with which these motions are effected within the equatorial zones that they might there serve to give the true time of the day."—(Nicollet, Essay on Meteor. Observ., page 7.) For we find maximums at 9½ a. m., 10, 11, 12 m., and minimums at 4 p. m., 4½, 5, 5½, 6, 6½, 7, and all this within the short period of seven days. This irregularity is the more remarkable, as the colony is a place where none of the extremes of heat and cold, or of

gales, hurricanes, and thunder storms are felt, that could disturb the equilibrium of the atmosphere.

Besides the two registers and the hourly observations, I have copied for you and inclosed the thermometrical observations for 12 months in 1854 and 1855. These have been taken with my old thermometer, which proves to be from 1½ to 5 degrees too high, as compared with the Smithsonian thermometer. Although this would make the mean temperature of the year about 3 degrees too high, we are still enabled to make some comparisons between the different months, which show that from August the mean monthly temperature is gradually sinking till January, which is the coldest month. After January it rises again till May, and then sinks till July. This seems to indicate that the rising and falling of the mean temperature keeps equal pace with the declination of the sun. If we now compare the means of the different hours of the day of each month, we find that the highest temperature of the day is not at 2 or 3 p. m., as in the United States, but at 12 o'clock at noon, and that the temperature at 3 p. m. is but a fraction greater than that at 9 a. m. In *five* months of the year it is nearly or quite the same with that at 9 a. m., viz: from November till March, inclusive; during the other part of the year, from May till September, inclusive, the mean temperature is higher at 3 p. m. than at 9 a. m., with the exception of October and April, where the temperature at 3 is even lower than that at 9; and these are the two months which follow immediately after the equinoxes. Another curious fact is the sudden rise of mean temperature from July to August. In Santa Fé de Bogota, in 4° 35′ north latitude, July is said to be even the coldest month of the year.

Some other facts could, no doubt, be drawn from this register by comparison, if its observations were founded upon a standard thermometer.

On the last page of this register of Colonia Tovar you will find some observations, taken with the same thermometer, of "Barry," during my stay at Chagres, on the Isthmus of Panama.

During my absence from the colony last winter some persons here, who can be relied upon, have seen white frost one morning. This is of extremely rare occurrence, but anyhow very remarkable for the latitude of 10° 26′, even at the height of 6,500 feet.

The characteristics of this region are its clouded sky, its equable temperature, and its great amount of moisture. It is the "happy region of the *ferns*," where these interesting plants find their most suitable climate and grow in the greatest profusion. Here it is where the stately tree-fern sometimes is seen to reach a height of 40 feet.

The produce most profitable to raise in the colony are potatoes, rye, and oats. The apple tree grows side by side with the banana. The strawberry is found in the greatest abundance, spontaneously growing about the fields. Indian corn does not come to maturity here, while I have seen it raised and matured in Santa Fé, New Mexico, which is at least 700 feet higher than the colony, and besides this is near 36° north latitude. But in New Mexico they have a cloudless sky nearly the whole year round and an extremely dry atmosphere, while the colonists of Tovar are not much molested from the beginning of May to the beginning of January by the rays of the sun.

The valley in which Colonia Tovar is situated was, so late as December, 1841, a perfect wilderness, covered with primitive forest. Not even the existence of this valley was known fifteen years ago, neither to the government nor to its owner. although it is only thirty-five miles west of Caracas, the capital of Venezuela, and in a straight line cannot be more than twelve miles from the sea. And when an attempt was made to explore this region not even a guide could be found for the small exploring party of fifteen men, headed by Colonel Codazzi, a skillful officer and compiler of the new map of Venezuela. When this party at last succeeded in crossing this region and reaching the sea-shore, they thought they had achieved a most extraordinary thing, (to cross a distance of twelve miles in six days;) and after they had returned to their homes none of them had a desire to do the feat over again. This was a party of natives. And when, at a later period, after the establishment of the colony, another skillful engineer found, with a party of colonists, his way to the opposite port of the sea-shore, the party did not venture to go back the same route, but rather chose the way by sea to Laguayra, from there to Caracas and back to the colony, a very circuitous route certainly. Such is the nature of this mountain region, with its precipices, waterfalls, deep ravines, and its dense, almost impenetrable primeval forests.

In collecting botanical specimens, I have penetrated, without a companion, the wilderness around in different directions, also that on the other side of the principal mountain range towards the sea, and can testify to the difficulties and hardships which are met with in exploring such a country. On excursions of this kind the most needful thing besides a compass is a short sabre, called "machetta," which I have to use continually in cutting through the lianos, the erect and climbing canes, the under shrub, which is all matted and intermingled in a thousand different ways into a dense mass of vegetation.

In these woods, where the rays of the sun never touch the ground, there it is where moisture and a cool temperature reign forever. The trunk of every tree and its branches are covered with Ferns, Lycopodiaceæ, Mosses, Hepaticæ, Lichens, Orchids, Bromeliads, Araceæ and besides Piperacæ with many exogenous plants too numerous to mention.

The soil in these forests is one entire mass of slender rootlets most completely intermingled and interwoven, more than a foot in thickness, the interstices filled with a brown but imperfectly decomposed vegetable mould, which is kept in its place by the network of the rootlets. This stratum is covered with mosses and remnants of leaves, so that on the mountain ridges not only the ground, but also the trunks and branches of the trees, act like a thick layer of sponges in retaining the water that either pours down in form of rain or settles more slowly in the form of mist and clouds. This water is allowed to trickle and sink down but very gradually, and is, therefore, a never-failing source from which are constantly fed the many little rivulets that hurry down the steep declivities into their common receptacle, the narrow chasm of the river Tuy, which, in one continued row of cascades, rushes thundering down SE. and S. until after a run of twenty miles, turning suddenly to the east, it finds a more level country.

In the depth of such a mass of vegetation, when man is by himself, a feeling of loneliness takes the ascendency over every other emotion; no animal is seen, and but seldom the voice of a bird heard. While on the sea-side of the mountains I was only made twice aware of the vicinity of a bird in two days. In the neighborhood of farms and habitations of men a greater variety of birds are seen and heard, and sometimes the grunting or howling of monkeys and the deafening cry of parrots.

The dry season commences here generally soon after New Year's day and lasts till the end of April. The remainder of the year is taken up by the rainy season. This is *generally* so, for there are many exceptions, and our notions about the great regularity and sharply defined seasons of the tropics, which we have received from books, are sometimes materially upset and corrected by experience. When I first came to the colony, in March, 1854, we had a dry season in its usual way. The rainy season then commenced on the 23d of April, but it did not end with the latter part of December, as is usually the case; it lasted till the end of January, and commenced again with the first of March, and then kept uniformly on till the end of December, 1855. The dry season was, therefore, only of one month's duration instead of four. The last dry season has been, on the contrary, unusually long, and lasted till the latter part of May.

I have often thought that the climate of North America may stand in some kind of relation to the climate of this country. It was on the 24th of December, 1853, when I left New York, to sail for Laguayra. We were hardly out of sight of land when a furious NW. gale, a real hurricane, (which is still in fresh remembrance with some of the captains I have lately seen,) during a period of three days threatened our destruction. After my arrival in Venezuela I was told that about Christmas, 1853, one of the most fearful gales from the north was felt at Laguayra.* Another question is, whether the late remarkably dry and cold winter of the United States and the unusually long *dry season* of Venezuela, as also the remarkable appearance of white frost in the colony, are not connected in some way or other.

As to the trade winds, I found on my trip from Philadelphia to Laguayra that *within the tropics* we had no E.NE. wind, which is thought to be the regular trade winds of those regions. After crossing latitude 23½°, in longitude 68½°, we were becalmed for one day, and soon after got a fresh breeze from the south, which we kept all the way to longitude 63°. By tacking we got to latitude 22°, longitude 63½°. From thence we had the wind all the time from S.SE, which we kept to latitude 11½° the day before we reached Laguayra. Capt. Wilkins, who has been in this southern trade for eighteen years, assured me that within the last eight years he never could depend much upon the trade winds. He finds that between latitude 23° and 18° the south wind frequently keeps on blowing very brisk for eight days in succession.

On the way from the colony to Caracas, along the high ridge of the principal mountain chain, which stretches E. and W., parallel

* See page 188.

with the coast, at an elevation of from 7,000 to 8,000 feet, we travel about six miles over a region bare of forest, where we nearly at all times find a very strong breeze from the south, rushing up the declivity and over the ridge, hurries off to the north towards the ocean. The ocean can be plainly seen from this elevation. That this great current of air does not sink down along the northern slope, but, on the contrary, is somewhat projected upwards by the shape of the mountain, can be seen by the course of the condensed vapors which, in the form of fog and mist, are driven along. May not this current of air sink gradually lower and lower until it reaches about latitude 18°, where it strikes the sea? I have found this south wind at sea always much colder than any of the other winds in these latitudes.

I wish I was in possession of some good work on the winds and the currents of the ocean.

Vegetation at the colony is uninterrupted throughout the whole year, except in a small class of plants which cannot thrive without a great deal of moisture. Even in the dry season, when the lower regions are parched up with heat, if there is any moisture at all in the atmosphere capable of being condensed, the mountainous districts, especially those covered with forests, are sure to get some of it. Trees here are evergreens; they keep their branches and twigs clothed with leaves until death. Day after day, and month after month, the surrounding forest presents the same unchanged view in its deep green garment. Single leaves fall here and there one by one; and new leaves appear as slowly and gradually as the old ones die away—unnoticed and unobserved. The pleasing and hope-inspiring spectacle of returning spring, in the sudden appearance of the new and tender foliage, as seen in the temperate regions, is here unknown.

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COLONIA TOVAR, *January* 8, 1857.

DEAR SIR: Under date of August 5 I sent you a letter and some registers of meteorological observations up to the 31st of July, which, I hope, you will have received long before this.

Inclosed in a separate envelope I send you now four meteorological registers for the months of August, September, October and November. I would have sent one for December also, but I have no more blanks.

Besides these registers, I have inclosed diagrams* on four separate sheets, one table of half-hourly barometrical observations, and one about the course of the clouds.

The barometrical observations in the registers have their full value only up to October 30, at 2 p. m; for when I looked at the height of the mercury one hour afterwards I found it more than one inch below its usual level. This was so extraordinary that I expected something wrong with the instrument. As soon as I touched it the whole column of mercury sank rapidly down. In unscrewing the brass cup which contains the little leather bag I found the former half filled with mercury. On the surface of the bag, a little below

* The diagrams and curves could not be given in this report.

where it is tied and where it was in contact with the surrounding brass tube, I found a spot of one-eighth of an inch diameter, as if corroded by some kind of acid In the centre of this spot was a hole one-sixteenth inch diameter. The corroded rim around the hole was very smooth and viscid, similar to partly dissolved india rubber. After sewing up the whole and giving it a coat of glue, to prevent the mercury from leaking out, I filled the glass tube again as cautiously as possible, to prevent the formation of air bubbles. In this I succeeded pretty well, and, with the exception of one minute portion of air, which escaped into the vacuum, the latter seemed to be complete. The mercury then showed but a small difference ($\frac{2}{100}$ to $\frac{3}{100}$ parts of an inch lower) compared with its former state. Hoping to succeed still better the second time, I tried my hand once more at it, but did not succeed so well this time, as some moisture had settled in the glass tube. The mercury is now at least one-tenth of an inch lower than it ought to be.

The barometrical observations made with this instrument since the 1st November, 1856, can, of course, not be considered as normal, and can be used only with a view to institute comparisons among themselves.

I feel this defect the more acutely as I hoped to measure a number of mountains and other localities, and to complete a twelve months' register, to find out the mean height of the barometrical column for the different months of the year. Up to the 1st November I found the mean height greatest in July. Hitherto I have measured only the pass over the mountains on the road from the colony to Victoria. On this spot the barometer was 23.334 at 7*h*. 30*m*. a. m., September 9, with the thermometer at 61°.

In the diagrams on sheet No. 1, I have laid down, in a graphical manner, the hourly and half-hourly rise and fall of the barometer from 6 a. m. till 9 p. m. for 12 days. We can see here, at once, the greater amplitude of the daily periodical variations in October compared with that of June; also that the hours of maximum of the different days in October are not far apart from each other and near to 10½ a. m., and the hours of minimum not far from 4 p. m.; while, on the contrary, in June, the hours of maximum, as well as those of minimum, are much more scattered, and therefore not so regular.

On sheet No. 2 are the half-hourly observations laid down for 24 hours, from 4 a. m., October 7, till 4 a. m. next day. Here we observe that, in the morning, the maximum, as well as the minimum, is somewhat higher than the maximum and the minimum in the evening. This seems to be a general rule with all the daily periodical variations.

On sheet No. 3 the daily mean barometer heights from June 10 to October 30 are put down and connected by straight lines to denote the course of the barometer from day to day throughout the several months. A kind of periodical rising and sinking is observable here, alternately taking place in periods of 4 or 5 days, at least for June, July, August and September.

On sheet No. 4 is to be found a comparison of the mean monthly barometer heights of Colonia Tovar with those of St. Louis, Mo.,

made by Dr. G. Englemann in 1851, which shows the remarkably small monthly variation in the colony against the extreme range of atmospheric pressure at St. Louis.

In all these illustrations the barometer height has not been reduced to the freezing point for want of the necessary tables; but, as the difference of temperature connected with these observations does not range much over 8 degrees F., the results may be considered not far from their true value

Table No. 5 shows that the most prevailing currents of air at an elevation of about 7,000 or 8,000 feet above the level of the sea, in the months of June, July, August, September and October, are here from E., E.SE., SE., S.SE., and S., but especially from SE.

Table No. 6 contains half-hourly barometrical observations for 17 days, taken down at three different periods of the year. From this and from sheet No 1 we see that the amplitude of the daily periodical variations is not a constant quantity in one and the same place, but changes with the different periods of the year; as also does the hour of maximums and minimums. To find out, by continued observation, the mean amount of amplitude and the precise time of the maximums and minimums for each month of the year seemed to me desiderata of much interest to meteorology.

With a view to investigate this matter I have made observations accordingly. The first set I made from 18th to 24th June; the second, from 1st to 7th October; the third, from 10th to 12th November, and the fourth, from 22d to 28th December. These observations give the mean amplitude for the latter part of June 0.058; for the first part of October, 0.079; for November, 0.060, and for the end of December, 0.043.

By a peculiar view of the cause of periodical variations, and by the aid of an artificial globe, I had calculated as early as last September that the amplitude at Colonia Tovar ought to be greatest about the 16th May and 26th September, and least on the 21st January. The above-mentioned numbers of amplitude for October, November, and December coincide with my calculations so far, and it remains to be seen how they will do for the remaining portion of the year.

With regard to temperature I will only say that the mean of the three months of June, July, and August, (that is, of the *meteorological* summer,) is 58 9; the mean of September, October, and November (the meteorological autumn) is 58.9, or exactly the same. The mean temperature of December is 56.6. During 204 days (from June 10 to December 31) the sky was only once free of clouds at 2 p m., 18 times free at 7 a. m., and 41 times at 9 p. m. Of these 204 days 143 were rainy days.

On the 5th of January I made a botanical excursion to one of the highest mountains of this region, about twelve miles to the east of the colony. The mountain, according to my estimation, may be about 7,800 feet above the level of the sea, and is a kind of central point or knot, from which several rivers, flowing in different directions, take their origin. This mountain is covered by a dense forest, with the exception of a level spot of about half a mile in length and a quarter

of a mile in width, which forms a kind of shallow basin, only sparingly covered by a thin coat of short grass and other small plants. These plants I found the next morning at six o'clock white and stiffened with heavy hoar frost, which augmented and lasted till the rays of the sun fell upon it. The stiffened leaves of the herbs broke under the least pressure, like thin layers of ice. The thermometer was 37° at 6*h*. 30*m*. From all the information I could gather, hoar frost seems to be common in this spot throughout the months of January and February. The wind blew during the night from northeast, and was very piercing.

Notwithstanding this low temperature, the forests of the neighboring heights surrounding this basin are clothed in perpetual green, and the stately wax palm, with its straight and polished trunk of 70 or 80 feet, (by actual measurement,) rears, uninjured, its slender form and its leaf adorned head high above all other trees.

In this excursion I had also an opportunity to form some idea of the vast extent of destruction which was carried into the mountain forest last February by a lucifer match and a thoughtless boy. Over whole tracts of this primeval forest the trees lie dead one over the other, as if uprooted by a whirlwind, scarcely showing any marks of fire on their trunks. I was struck more than ever with the easy manner in which fire can destroy these dense and humid forests, which, by their shade, preserve a cool and moist atmosphere, and thereby cause the vapors of the adjacent strata of air to condense into clouds, that rest upon them, with little intermission, during nine months in the year. In these high regions the temperature is so low and equable that the vegetable matter which is gathered on the ground between the trees is decomposed very incompletely and very slowly. It forms a stratum of loose half-decomposed matter, in some places two to three feet thick, which, in the rainy season, like an immense layer of sponge filled with water, feeds and supplies the rivulets and rivers *gradually*. In the midst of the dry season this layer becomes sometimes dry enough to burn, when kindled, with but little flame, and more like tinder, spreading in all directions.

In this way the fire extends until met by a river or a road, or some other obstacle. The sub-soil which underlies the spongy stratum on these mountains is also very shallow and resting on hard rocks. The roots of the trees therefore, do not go down very deep, but extend more in a horizontal direction. When the spongy layer, with the smaller roots, are burnt, the trees lose their hold entirely and fall, one over the other, in all directions. They die less from being burnt than from being uprooted. Many different kinds of tall reeds soon take the place of the trees. In a few years these reeds exclude everything else. The fertile mould that may perhaps have escaped destruction by fire is by and by carried down the declivities by the frequent rains. The region, no longer shaded by high trees, becomes dry. Subsequent conflagrations of adjacent savannahs, which are intentionally set on fire to procure a new growth of young grass, take hold of the reeds of the ruined forest, until, by the repeated attacks of these fires, the roots of the reeds can stand it no longer, and the smaller grasses, interspersed with a few other plants, take their places.

On the road from the colony to Caracas we pass througl in which this process is going on; the reeds giving gradua the smaller grasses. Here the great number of half burnt ing trunks of the wax palm tell plainly enough that there e long ago a dense and humid forest, in which they luxuria their beauty, for these palms are never found, in their natu growing in any other but humid forests. Here they stan in the midst of reeds. Most of them have died already, linger yet in a dying condition, until their last green leaf l brown, and then they stand like tall and slender pillars, the remnants of a once stately forest.

This is the same extensive region of which I spoke in my f where a strong southern breeze, sometimes amounting t sweeps constantly over the mountain ridge towards the sea traversed this region since at four different times, in the August and September, and found every time the same sout blowing there, only somewhat more violent.

Before closing this letter I wish to add to the statemen my first letter* about the gale of December 24, 1853, that n ant here, in saying that the gale was felt at Laguayra, forg tion that it was felt only in the unprecedented agitation of but *not* in the *atmosphere*. This agitation of the sea is obse time a violent gale from the north has been blowing in t latitudes, not the least breeze from the north being felt at time at Laguayra, although it is an open roadstead, not in sheltered against the north winds. This agitation of the the air was perfectly calm, I have seen myself several tim guayra; but at the time above mentioned the sea was so high that long, enormous, foam-crested waves rolled up t parapet of the custom-house, a phenomenon scarcely ever se

During my stay in Victoria, a town twenty miles sou colony, situate in a valley about 1,700 feet above the level c I made the following observations as to the temperature of t

| December | 21 | 22 | 23 | 24 | 25 | 26 | 27 |
|---|---|---|---|---|---|---|---|
| 6 a. m | 70½ | 69 | 69 | 69 | 68 | 68 | 68 |
| 1 p. m | 86 | 86 | 75 | 75 | 81½ | 83 | 84 |
| 9 p. m | 74 | 72 | 72½ | 72 | 71 | 72 | 72 |

The dry season has already set in, and my time is so much by botanical labors, on which my sustenance depends, that able to give at present a more full and extended account of t and other atmospherical phenomena of this region.

* See page 183.

No. 1.—*Register of Meteorological Observations.*

| Date. | Barometer.* Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1856. Dec'r 1 | 23.794 | 23 804 | 23.800 | 56° | 62° | 58° | 55° | 60° | 54° | 56.3 | The same as thermometer in open air. | 53 | 53 | 53 |
| 2 | .790 | .792 | .798 | 56 | 61 | 58 | 53 | 58 | 54 | 56.0 | | 54 | 57 | 52 |
| 3 | .780 | .803 | .808 | 53 | 64 | 58 | 52 | 65 | 54 | 57 0 | | 48 | 61 | 53 |
| 4 | .810 | .800 | .810 | 57 | 62 | 58 | 56 | 64 | 54 | 58.7 | | 55 | 61 | 55 |
| 5 | .824 | .814 | .820 | 51 | 61 | 60 | 57 | 60 | 57 | 58.0 | | 56 | 59 | 56 |
| 6 | .802 | .810 | .814 | 54 | 61 | 59 | 51 | 60 | 57 | 56.0 | | 46 | 58 | 55 |
| 7 | .800 | .808 | .804 | 54 | 64 | 54 | 52 | 62 | 52 | 55.3 | | 47 | 56 | 48 |
| 8 | .804 | .805 | .800 | 56 | 62 | 59 | 54 | 61 | 60 | 58.3 | | 53 | 60 | 58 |
| 9 | .814 | .806 | .818 | 59 | 63 | 60 | 60 | 65 | 57 | 60.7 | | 58 | 61 | 56 |
| 10 | .812 | .810 | .788 | 58 | 61 | 58 | 57 | 63 | 56 | 58.7 | | 56 | 62 | 55 |
| 11 | .786 | .776 | .798 | 58 | 61 | 58 | 57 | 60 | 57 | 58.0 | | 56 | 59 | 56 |
| 12 | .786 | .782 | .770 | 58 | 61 | 54 | 57 | 64 | 52 | 57.7 | | 55 | 61 | 46 |
| 13 | .808 | .814 | .808 | 52 | 63 | 54 | 53 | 64 | 57 | 58.0 | | 49 | 59 | 55 |
| 14 | .782 | .790 | .796 | 54 | 61 | 56 | 54 | 60 | 54 | 56 0 | | 52 | 59 | 51 |
| 15 | .784 | .802 | .812 | 54 | 61 | 58 | 52 | 62 | 56 | 56.7 | | 51 | 61 | 54 |
| 16 | .800 | .804 | .810 | 53 | 60 | 56 | 52 | 59 | 53 | 54 7 | | 51 | 58 | 52 |
| 17 | .790 | .796 | .796 | 53 | 61 | 56 | 54 | 60 | 51 | 55.0 | | 48 | 58 | 49 |
| 18 | .772 | .777 | .786 | 54 | 60 | 55 | 53 | 60½ | 53 | 55.5 | | 49 | 58 | 46 |
| 19 | .762 | .776 | .780 | 54 | 61 | 57 | 54 | 62 | 52 | 56.0 | | 48 | 56 | 50 |
| 20 | .762 | .766 | .792 | 55 | 62 | 56 | 52 | 60 | 53 | 55.0 | | 51 | 57 | 53 |
| 21 | .764 | .782 | .800 | 48 | 63 | 56 | 49 | 62 | 51 | 54.0 | | 41 | 58 | 48 |
| 22 | .790 | .788 | .792 | 56 | 64 | 57 | 55 | 67 | 52 | 58.0 | | 54 | 61 | 50 |
| 23 | .772 | .774 | .760 | 53 | 62 | 52 | 51 | 65 | 53 | 56.3 | | 50 | 60 | 52 |
| 24 | .788 | .790 | .752 | 52 | 63 | 54 | 51 | 61 | 51 | 54.3 | | 50 | 58 | 48 |
| 25 | .752 | .780 | .800 | 53 | 65 | 57 | 52 | 63 | 55 | 56.7 | | 41 | 57 | 53 |
| 26 | .818 | .812 | .816 | 58 | 63 | 61 | 56 | 61 | 56 | 57.7 | | 54½ | 60 | 55 |
| 27 | .808 | .802 | .796 | 58 | 63 | 60 | 56 | 60 | 57 | 57.7 | | 55 | 59 | 55 |
| 28 | .774 | .784 | .772 | 56 | 60 | 56 | 55 | 60 | 52 | 55.7 | | 52 | 55 | 51 |
| 29 | .762 | .778 | .784 | 51 | 61 | 55 | 50 | 60 | 50 | 53.3 | | 45 | 58 | 48 |
| 30 | .794 | .793 | .816 | 54 | 61 | 59 | 52 | 61 | 54 | 55.7 | | 51 | 57 | 53 |
| 31 | .808 | .808 | .820 | 55 | 64 | 57 | 54 | 65 | 55 | 58.0 | | 52 | 60 | 54½ |
| Total..... | 24492 | 24626 | 24716 | ..... | ..... | ..... | 1669 | 1914 | 1681 | 17550 | ..... | 1581.5 | 1822 | 1620.5 |
| Mean .... | 23.790 | 23.794 | 23.797 | ..... | ..... | ..... | 53.8 | 61.8 | 54.2 | 56.6 | ..... | 51.0 | 58.8 | 52.3 |
| | 23 791 | | | | | | 56.6 | | | | | 54.0 | | |

* .200 too low; barometer defective.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Am'nt. | Course. | Veloc'y | Kinds. | Am'nt. | Course. | Veloc'y | Kinds. | Am'nt. | Course. | Veloc'y | Kinds. | Direc'n. | Force. | Direc'n. | Force. | Direc'n. | Force. |
| 1856. | | | | | | | | | | | | | | | | | | | | |
| Dec. 1 | 2.30 p. m. | 3.10 p. m. | 1 | E | 2½ | | 10 | E | 3 | | 0 | | | | | | | | | |
| 2 | 1 p. m. | 2.15 p. m. | 5 | N | 2 | | 10 | SE | 2½ | | 0 | | | | | | | | | |
| | 4 p. m. | 4.20 p. m. | | | | | | | | | | | | | | | | | | |
| 3 | | | 1 | | | | 8 | | | | 0 | | | | | | | | | |
| 4 | 11.50 a. m | 4.5 p. m | 7 | SE | 1 | | 7 | E | 2½ | | 5 | E | 2 | | | | | | | |
| 5 | 12.25 p. m. | 6.10 p. m. | 8 | NE. & SE | 1 | | 10 | | | | 5 | E | 2½ | | | | | | | |
| 6 | 12.50 p. m. | 2.30 p. m. | 0 | | | | 7 | E | 2½ | | 10 | E | 2 | | | | | | | |
| 7 | | | 0 | | | | 2 | SE | 2½ | | 0 | | | | | | | | | |
| 8 | 1 p. m. | 2.15 p. m. | 1 | SE | 2 | | 8 | SE | 3 | | 0 | | | | | | | | | |
| 9 | 4.30 p. m. | 6.20 p. m. | 7 | E | 2 | | 9 | E.SE | 2½ | | 2 | E | 2 | | | | | | | |
| 10 | 12.10 p. m. | 2.15 p. m. | 10 | | | | 7 | SE | 2½ | | 10 | E | | | | | | | | |
| 11 | 8 30 a. m. | | 10 | E | 2 | | 10 | E | 3 | | 7 | SE | 2½ | | | | | | | |
| 12 | 11.30 a. m. | 12.30 p. m | 9 | E | 2½ | | 10 | E | 2 | | 5 | | | | | | | | | |
| 13 | | | 10 | E | 2 | | 9 | E | 2 | | 0 | | | | | | | | | |
| 14 | 8.45 a. m. | 6.20 p. m. | 0 | | | | 10 | E | 2½ | | 0 | | | | | | | | | |
| 15 | 2.10 a. m. | 4.30 p. m. | 3 | E.SE | 2½ | | 10 | E | 2 | | 3 | | | | | | | | | |
| 16 | 1 p. m. | 4.10 p. m. | 9 | NE | | | 10 | E | | | 0 | | | | | | | | | |
| 17 | 1.30 p. m. | 3 p. m. | 0 | | | | 10 | E.SE | 2 | | 0 | | | | N | 4 | | | | |
| 18 | 12 m. | 2.15 p. m. | 2 | E.NE | 2 | | 10 | E.NE | 2 | Mist | 0 | | | | | | | | | |
| | 5 p. m. | 6 40 p. m. | | | | | | | | | | | | | | | | | | |
| 19 | | | 2 | N | 4 | | 5 | E | 2½ | | 0 | | | | | | | | | |
| 20 | 5.30 p. m. | 5.50 p. m. | 9 | N | 3 | | 7 | N & E.SE | 2 | | 9 | N | 4 | | | | | | | |
| 21 | | | 0 | | | | 9 | SE | 2½ | | 0 | | | | | | | | | |
| 22 | 1.15 p. m. | 5 p. m. | 10 | NE | 2 | Mist | 9 | E.SE | 3 | | 0 | | | | | | | | W | 2 |
| 23 | 2.30 p. m. | 3 p. m. | 0 | | | | 9 | SW | 3 | | 0 | | | | | | | | W | 2 |
| 24 | | | 0 | | | | 8 | SE | 2½ | | 0 | | | | | | | | W | 2½ |
| 25 | | | 0 | | | | 5 | SE | 2 | | 0 | | | | | | | | | |
| 26 | 8.30 a. m. | 9.15 a m. | 10 | E.SE | 2 | | 10 | NE | | | 0 | | | | | | | | | |
| | 10.30 a. m. | 11 a. m. | | | | | | | | | | | | | | | | | | |
| | 2 p m. | 8 p. m. | | | | | | | | | | | | | | | | | W | 2 |
| 27 | 1.30 p. m. | 3.15 p. m. | 9 | N | 3 | | 10 | E | 3 | | 2 | | | | | | | | W | 2 |
| 28 | | | 2 | NW | 4 | | 7 | N | 3 | | 1 | | | | | | | | | |
| 29 | | | 1 | | | | 10 | E | 3 | | 1 | | | | W | 1 | | | | |
| 30 | 10 a. m. | 11.15 a. m. | 8 | NE | 3 | | 10 | NE | 2½ | | 7 | | | | | | | | | |
| 31 | 2.10 p. m. | 3 p. m. | | | | | | | | | | | | | | | | | | |
| | | | 2 | | | | 6 | E.SE | 2½ | | 4 | NW | 4 | | | | | | | |
| Total | | | 136 | | | | 202 | | | | 71 | | | | | | | | | |
| Mean | | | 4.4 | | | | 6.5 | | | | 2.3 | | | | | | | | | |

| Date. | Barometer.* Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Low temperatures. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Jan. 1 | 23.814 | 23.814 | 23.824 | 55° | 63° | 59° | 54° | 64° | 55° | 57.7 | The same as thermometer in open air. | 52 | 60 | 54 | |
| 2 | .808 | .800 | .800 | 56 | 63 | 56 | 55 | 65 | 53 | 57.7 | | 53½ | 62 | 50 | |
| 3 | .795 | .794 | .804 | 55 | 62 | 57 | 55 | 64 | 55 | 58.0 | | 50 | 60 | 54 | |
| 4 | .800 | .804 | .805 | 55 | 65 | 57 | 55 | 67 | 53 | 58.3 | | 53 | 60 | 51 | |
| 5 | .804 | .796 | .796 | 53 | 63 | 59 | 53 | 66 | 49 | 56.0 | | 47 | 60 | 43 | |
| 6 | .776 | .782 | .808 | 47 | 61 | 55 | 46 | 63 | 50 | 53.0 | | 40 | 56 | 48 | |
| 7 | .812 | .812 | .830 | 56 | 62 | 54 | 57 | 63 | 51 | 57.0 | | 49 | 58 | 49 | |
| 8 | .804 | .818 | .836 | 53 | 60 | 55 | 52 | 61 | 53 | 55.3 | | 50 | 57 | 52 | At 6.20 a. m. = 51°; at 6.30 a. m. 49°; at 6.35 a. m. 50°. |
| 9 | .808 | .828 | .838 | 51 | 59 | 55 | 49 | 58 | 52 | 53.0 | | 46 | 56 | 51 | At 6.30 a. m. 49°. |
| 10 | .808 | .811 | .808 | 55 | 58 | 55 | 52 | 54 | 52 | 52.7 | | 52 | 54 | 51 | |
| 11 | .802 | .810 | .828 | 53 | 60 | 56 | 52 | 60 | 53 | 55.0 | | 49 | 58 | 52 | At 6.30 a. m. 50°. |
| 12 | .826 | .836 | .843 | 51 | 63 | 54 | 51 | 62 | 52 | 55.0 | | 49 | 58 | 48 | At 6.30 a. m. 47½°. |
| 13 | .830 | .825 | .820 | 53 | 60 | 55 | 53 | 61 | 51 | 55.0 | | 50½ | 59 | 48 | At 6.30 a. m. 51°. |
| 14 | .814 | .828 | .830 | 49 | 61 | 53 | 49 | 62 | 51 | 54.0 | | 42 | 50 | 49 | At 6.15 a. m. 46°; at 6.25 a. m. 45°; at 6.30 a. m. 46° |
| 15 | .828 | .836 | .852 | 50 | 61 | 54 | 48 | 62 | 52 | 54.0 | | 43 | 57 | 49 | |
| 16 | .842 | .846 | .844 | 52 | 62 | 55 | 51 | 58 | 51 | 53.3 | | 49 | 56 | 51 | |
| 17 | .826 | .826 | .820 | 52 | 62 | 57 | 52 | 62 | 52 | 55.3 | | 47 | 57 | 5[illegible] | |
| 18 | .808 | .822 | .832 | 49 | 60 | 53 | 50 | 63 | 51 | 54.7 | | 46 | 59 | 48 | |
| 19 | .820 | .828 | .830 | 52 | 60 | 54 | 51 | 61 | 51 | 51.3 | | 48 | 55 | 49 | |
| 20 | .828 | .828 | .842 | 53 | 59 | 53 | 52 | 57 | 53 | 54.0 | | 51 | 56 | 47 | |
| 21 | .826 | .840 | .842 | 50 | 59 | 54 | 50 | 59 | 50 | 53.0 | | 46 | 56 | 47 | |
| 22 | .822 | .826 | .818 | 50 | 62 | 54 | 50 | 65 | 52 | 55.7 | | 47 | 58 | 50 | |
| 23 | .820 | .826 | .820 | 52 | 60 | 53 | 52 | 60 | 53 | 55.0 | | 49 | 56 | 41 | |
| 24 | .818 | .830 | .844 | 50 | 60 | 52 | 49 | 62 | 49 | 53.3 | | 45 | 57 | 47 | |
| 25 | .828 | .828 | .832 | 52 | 58 | 52 | 52 | 58 | 50 | 53.3 | | 50 | 55 | 44 | |
| 26 | .824 | .824 | .820 | 52 | 56 | 52 | 51 | 55 | 50 | 52.0 | | 51 | 53 | 48 | |
| 27 | .846 | .802 | .804 | 51 | 55 | 52 | 50 | 56 | 50 | 52.0 | | 50 | 51 | 49 | |
| 28 | .788 | .792 | .800 | 52 | 52 | 56 | 50½ | 57 | 52 | 53.0 | | 50½ | 55 | 52 | |
| 29 | .796 | .802 | .804 | 54 | 57 | 52 | 54 | 58 | 50 | 54.0 | | 53 | 56 | 49 | |
| 30 | .806 | .820 | .836 | 51 | 59 | 53 | 51 | 60 | 51 | 54.0 | | 49 | 58 | 49 | |
| 31 | .832 | .834 | .838 | 52 | 60 | 53 | 54 | 60 | 52 | 55.3 | | 53 | 57 | 50 | |
| Total.. | 25259 | 25368 | 25528 | ..... | ..... | ..... | 1600 | 1883 | 1599 | 16939 | ..... | 1511.5 | 1763 | 1524 | |
| Mean... | 23.815 | 23.818 | 23.823 | ..... | ..... | ..... | 51.6 | 60.7 | 51.6 | 54.6 | ..... | 48.7 | 56.9 | 49.2 | |
| | 23.819 | | | | | | 54.6 | | | | | 51.6 | | | |

* .200 too low; barometer defective.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. | | | | | | | | | | | | | | | | | | | | |
| Jan. 1 | 1 p. m. | 1.30 p. m. | 1 | | | | 7 | E. | | | 0 | | | | W. | 2 | | | | |
| 2 | | | 5 | NE. | 2½ | Mist; 8, 8.5 a.m | 9 | SE | 3 | | 0 | | | | | | | | W. | 2 |
| 3 | | | 0 | | | | 6 | NE. | 2½ | | 3 | | | | | | | | N. | 2 |
| 4 | | | 0 | | | | 8 | NE. | 3 | | 1 | | | | | | | | W. | 2 |
| 5 | | | 2 | | | | 9 | S. | 2½ | | 0 | | | | | | | | W. | 2 |
| 6 | | | 0 | | | | | | | | 0 | | | | | | | | W. | 2 |
| 7 | | | 1 | | | | 5 | N.NW | 1 | | 0 | | | | | | | | W. | 2 |
| 8 | 5.15 p. m. | 5.45 p. m. | 0 | NW. | 2 | | 9 | S. | | Mist. | 9 | NW. | 2½ | | | | | | | |
| 9 | | | 0 | | | | 9 | N.NW. & S. | 2 2 | Mist. | 2 | N. | 2½ | | W. | 1 | | | W. | 2 |
| 10 | 5 p m. | 5.30 p. m. | 8 | N. | 4 | | 9 | E.NE. N. | 2 3 | Upper... Lower... | 5 | NE. | 3 | | | | | | | |
| 11 | | | 0 | | | | 9 | N. | 2 | | 0 | | | | W. | 2 | | | | |
| 12 | | | 1 | | | | 9 | E. | 2 | | 0 | | | | W. | 2 | | | W. | 2 |
| 13 | 12.45 p. m 2.30 p. m. | 1.10 p. m. 5.15 p. m. | 0 | | | | 9 | E.SE. | 1 | | 0 | | | | W. | 2 | | | W. | 2 |
| 14 | | | 0 | | | | 3 | E. | 2 | | 1 | | | | W. | 2½ | | | W. | 3 |
| 15 | | | 0 | | | | 9 | N. SE. | 2 2½ | | 0 | | | | SW. | 2½ | | | | |
| 16 | | | 2 | NE. | | | 10 | N. | | Mist. | 5 | NW. | | Mist. | | | | | | |
| 17 | 2.40 p. m. | 3.10 p. m. | 4 | N. | | | 9 | N. | | | 0 | | | | | | | | W. | 2 |
| 18 | | | 0 | | | | 9 | S. | | | 0 | | | | | | | | W. | 2 |
| 19 | | | 0 | | | | 8 | N. | | | 0 | | | | N. | | | | W. | 2 |
| 20 | 11 a. m. 12.50 p. m. | 12.15 p. m. 5.30 p. m. | 10 | NE. | | | 10 | E. | | | 0 | | | | | | | | W. | 2 |
| 21 | 4.10 p. m. | 4.30 p. m. | 2 | | | | 8 | N. | 2 | | 0 | | | | | | | | W. | 2 |
| 22 | | | 0 | | | | 7 | NE. | 2 | | 0 | | | | W. | | | | W. | 2 |
| 23 | | | | | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 10 | NE | 2 | Mist | 9 | | | Mist | | | | | | |
| | | | | | | | 10 | SE | 2 | | 0 | | | | | | | | W | 2 |
| 31 | 2.20 p.m. | 2.25 p.m. | 9 | E | | | 9 | S | | | 7 | W | | | | | A | | W | 2 |
| | | | 1 | | | | 10 | SE | | | 0 | | | | | | | | | |
| Total | | | 84 | | | | 256 | | | | 42 | | | | | | | | | |
| Mean | | | 2.7 | | | | 8.3 | | | | 1.4 | | | | | | | | | |

No. 1 —*Register of Meteorological Observations*—Continued.

| Date. | Barometer.* Height. 7 A. M. | Barometer.* Height. 2 P. M. | Barometer.* Height. 9 P. M. | Barometer.* Thermometer attached. 7 A. M. | Barometer.* Thermometer attached. 2 P. M. | Barometer.* Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Feb. 1 | 23.814 | 23.824 | 23.822 | 55° | 60° | 56° | 56° | 63° | 53° | 57.3° | The same as thermometer in open air. | 54° | 61° | 51° | At 6 a. m., 50°. |
| 2 | .814 | .819 | .836 | 54 | 60 | 55 | 56 | 59 | 52 | 55.7 | | 53 | 57½ | 50 | |
| 3 | .816 | .828 | .826 | 51 | 60 | 53 | 54 | 60 | 49 | 54.3 | | 42 | 56 | 43½ | At 6.20 a. m., 51°. |
| 4 | .818 | .808 | .814 | 51 | 61 | 52 | 54 | 62 | 46 | 54.0 | | 51 | 62 | 42 | At 6 a. m., 47°. |
| 5 | .802 | .780 | .780 | 53 | 59 | 55 | 55 | 60 | 52 | 55.7 | | 48 | 58 | 50 | |
| 6 | .768 | .764 | .762 | 55 | 61 | 55 | 55 | 64 | 52 | 57.0 | | 53 | 60 | 50 | |
| 7 | .750 | .760 | .770 | 53 | 61 | 58 | 52 | 60 | 57 | 56.3 | | 50 | 57 | 54 | At 6.30 a. m., 49°. |
| 8 | ..... | .782 | .808 | ..... | 62 | 57 | 53 | 62 | 55 | 56.7 | | 51 | 57 | 53 | |
| 9 | .780 | .782 | .792 | 56 | 59 | 56 | 56 | 57 | 55 | 56.0 | | 54 | 55 | 51 | |
| 10 | .784 | .788 | .796 | 55 | 61 | 57 | 55 | 63 | 51 | 56.3 | | 50 | 58 | 51 | |
| 11 | .784 | .790 | .808 | 55 | 59 | 54 | 53 | 58 | 51 | 54.0 | | 53 | 56 | 49 | |
| 12 | .798 | .820 | .834 | 53 | 61 | 57 | 56 | 61 | 54 | 57.0 | | 49 | 57 | 52 | Short and faint muttering of thunder, the first of this year. |
| 13 | .832 | .800 | .814 | 55 | 62 | 58 | 56 | 62 | 56 | 58.0 | | 54 | 59 | 54 | Faint thunder. |
| 14 | .798 | .792 | .808 | 55 | 61 | 59 | 55 | 59 | 55 | 56.3 | | 53 | 57½ | 54 | Thunder at 1½ p. m. |
| 15 | .808 | .790 | .810 | 57 | 60 | 56 | 56 | 58 | 55 | 56.3 | | 55½ | 57 | 53½ | |
| 16 | .808 | .798 | .800 | 55 | 62 | 55 | 56 | 60 | 55 | 57.0 | | 53 | 59 | 50 | |
| 17 | .810 | .796 | .816 | 56 | 63 | 55 | 59 | 63 | 52 | 58.0 | | 53 | 58½ | 49 | |
| 18 | .800 | .798 | .792 | 55 | 62 | 59 | 55 | 59 | 57 | 57.0 | | 54 | 59 | 55 | |
| 19 | .804 | .787 | .810 | 58 | 62 | 60 | 59 | 61 | 57 | 59.0 | | 56 | 59 | 56 | |
| 20 | .803 | .792 | .814 | 59 | 64 | 60 | 58 | 64 | 58 | 60.0 | | 56 | 61 | 57 | |
| 21 | .804 | .776 | .808 | 59 | 63 | 59 | 58 | 62 | 57 | 59.0 | | 56½ | 62 | 56 | |
| 22 | .792 | .774 | .796 | 58 | 63 | 59 | 57 | 63 | 56 | 58.7 | | 55 | 60 | 55 | |
| 23 | .792 | .768 | .792 | 57 | 62 | 60 | 57 | 64 | 58 | 59.7 | | 55 | 62 | 56 | |
| 24 | .800 | .784 | .818 | 59 | 63 | 58 | 58 | 61 | 55 | 58.0 | | 57 | 61 | 54 | |
| 25 | .812 | .815 | .820 | 56 | 63 | 58 | 57 | 63 | 54 | 58.0 | | 54 | 60 | 53 | |
| 26 | .820 | .810 | .814 | 55 | 63 | 55 | 56½ | 67 | 53 | 58.8 | | 53 | 62 | 51 | |
| 27 | .810 | .800 | .802 | 54 | 60 | 53 | 54 | 59 | 51 | 54.7 | | 52 | 56 | 45 | |
| 28 | .796 | .796 | .788 | 51 | 58 | 53 | 53 | 56 | 51 | 54.0 | | 50 | 57 | 49 | |
| Total... | 21.647 | 22.211 | 22.540 | ..... | ..... | ..... | 1559 | 1712 | 1507 | 1592.8 | ..... | 1475 | 1644.5 | 1444 | |
| Mean... | 23.801 | 23.793 | 23.805 | ..... | ..... | ..... | 55.7 | 61.1 | 53.8 | 56.9 | ..... | 52.7 | 58.7 | 51.6 | |
| | 23.800 | | | | | | 56.9 | | | | | 54.3 | | | |

* .900 too low; barometer defective.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | | | 10 | N | | Mist | 10 | NE | 2 | Mist | 9 | | | Mist | | | | | | |
| 30 | | | 7 | NE | | | 10 | SE | 2 | | 9 | | | | | | | | | |
| 31 | 2.20 p.m. | 2.25 p.m. | 2 | E | | | 9 | S | | | 7 | W | | | | | | | W | 2 |
| | | | 1 | | | | 10 | SE | | | 0 | | | | | | | | | |
| Total | | | 84 | | | | 256 | | | | 42 | | | | | | | | | |
| Mean | | | 2.7 | | | | 8.3 | | | | 1.4 | | | | | | | | | |

No. 1 —*Register of Meteorological Observations*—Continued.

| Date. | Barometer.* Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Feb. 1 | 23.814 | 23.824 | 23.822 | 55° | 60° | 56° | 56° | 63° | 53° | 57.3° | The same as thermometer in open air. | 54° | 61° | 51° | At 6 a. m., 50°. |
| 2 | .814 | .819 | .826 | 54 | 60 | 55 | 56 | 59 | 52 | 55.7 | | 53 | 57½ | 50 | |
| 3 | .816 | .828 | .826 | 51 | 60 | 53 | 54 | 60 | 49 | 54.3 | | 42 | 56 | 43½ | At 6.20 a. m., 51°. |
| 4 | .818 | .808 | .814 | 51 | 61 | 52 | 54 | 62 | 46 | 54.0 | | 51 | 62 | 42 | At 6 a. m., 47°. |
| 5 | .802 | .780 | .780 | 53 | 59 | 55 | 55 | 60 | 52 | 55.7 | | 48 | 58 | 50 | |
| 6 | .768 | .764 | .762 | 55 | 61 | 55 | 55 | 64 | 52 | 57.0 | | 53 | 60 | 50 | |
| 7 | .750 | .760 | .770 | 53 | 61 | 58 | 52 | 60 | 57 | 56.3 | | 50 | 57 | 54 | At 6.30 a. m., 49°. |
| 8 | ..... | .782 | .808 | ..... | 62 | 57 | 53 | 62 | 55 | 56.7 | | 51 | 57 | 53 | |
| 9 | .780 | .782 | .792 | 56 | 59 | 56 | 56 | 57 | 55 | 56.0 | | 54 | 55 | 51 | |
| 10 | .784 | .788 | .796 | 55 | 61 | 57 | 55 | 63 | 51 | 56.3 | | 50 | 58 | 51 | |
| 11 | .784 | .790 | .808 | 55 | 59 | 54 | 53 | 58 | 51 | 54.0 | | 53 | 56 | 49 | |
| 12 | .798 | .830 | .834 | 53 | 61 | 57 | 56 | 61 | 54 | 57.0 | | 49 | 57 | 52 | Short and faint muttering of thunder, the first of this year. |
| 13 | .832 | .800 | .814 | 55 | 62 | 58 | 56 | 62 | 56 | 58.0 | | 54 | 59 | 54 | Faint thunder. |
| 14 | .798 | .792 | .808 | 55 | 61 | 59 | 55 | 59 | 55 | 56.3 | | 53 | 57½ | 54 | Thunder at 1½ p. m. |
| 15 | .808 | .790 | .810 | 57 | 60 | 56 | 56 | 58 | 55 | 56.3 | | 55½ | 57 | 53½ | |
| 16 | .808 | .798 | .800 | 55 | 62 | 55 | 56 | 60 | 55 | 57.0 | | 53 | 59 | 50 | |
| 17 | .810 | .796 | .816 | 56 | 63 | 55 | 59 | 63 | 52 | 58.0 | | 53 | 58½ | 49 | |
| 18 | .800 | .788 | .792 | 55 | 62 | 59 | 55 | 59 | 57 | 57.0 | | 54 | 59 | 55 | |
| 19 | .804 | .787 | .810 | 58 | 62 | 60 | 59 | 61 | 57 | 59.0 | | 56 | 59 | 56 | |
| 20 | .803 | .792 | .811 | 59 | 64 | 60 | 58 | 64 | 58 | 60.0 | | 56 | 61 | 57 | |
| 21 | .804 | .776 | .808 | 59 | 63 | 59 | 58 | 62 | 57 | 59.0 | | 56½ | 62 | 56 | |
| 22 | .792 | .774 | .796 | 58 | 63 | 59 | 57 | 63 | 56 | 58.7 | | 55 | 60 | 55 | |
| 23 | .792 | .768 | .792 | 57 | 62 | 60 | 57 | 64 | 58 | 59.7 | | 55 | 62 | 56 | |
| 24 | .800 | .784 | .818 | 59 | 63 | 58 | 58 | 61 | 55 | 58.0 | | 57 | 61 | 54 | |
| 25 | .812 | .815 | .820 | 56 | 63 | 58 | 57 | 63 | 54 | 58.0 | | 54 | 60 | 53 | |
| 26 | .820 | .810 | .814 | 55 | 63 | 55 | 56½ | 67 | 53 | 58.8 | | 53 | 62 | 51 | |
| 27 | .810 | .800 | .802 | 54 | 60 | 53 | 54 | 59 | 51 | 54.7 | | 52 | 56 | 45 | |
| 28 | .796 | .796 | .788 | 51 | 58 | 53 | 53 | 56 | 51 | 54.0 | | 50 | 57 | 49 | |
| Total... | 21.647 | 22.211 | 22.540 | ..... | ..... | ..... | 1559 | 1712 | 1507 | 1592.8 | ..... | 1475 | 1644.5 | 1444 | |
| Mean... | 23.801 | 23.793 | 23.805 | ..... | ..... | ..... | 55.7 | 61.1 | 53.8 | 56.9 | ..... | 52.7 | 58.7 | 51.6 | |
| | 23.800 | | | | | | 56.9 | | | | | 54.3 | | | |

* .900 too low; barometer defective.

| Date. | Barometer.* Height. 7 A. M. | Height. 2 P. M. | Height. 9 P. M. | Thermometer attached. 7 A. M. | Thermometer attached. 2 P. M. | Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | 2 P. M. | 9 P. M. | Mean. | Psychrometer. Dry bulb. | Wet bulb. 7 A. M. | 2 P. M. | 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. March 1 | 23.800 | 23.784 | 23.795 | 55° | 61° | 59° | 55° | 63° | 57° | 58.0° | The same as thermometer in open air. | 53° | 57° | 55° | |
| 2 | .806 | .794 | .820 | 56 | 63 | 61 | 55 | 63 | 59 | 59.0 | | 54 | 57 | 57 | |
| 3 | .814 | .804 | .810 | 58 | 63 | 56 | 57 | 64 | 53 | 58.0 | | 54 | 60 | 49 | |
| 4 | .810 | .818 | .808 | 56 | 64 | 55 | 56 | 64 | 56 | 58.7 | | 52 | 57 | 53 | |
| 5 | .794 | .794 | .796 | 53 | 62 | 53 | 54 | 62 | 50 | 55.3 | | 48 | 57 | 47 | |
| 6 | .792 | .794 | .790 | 52 | 62 | 53 | 54 | 67 | 50 | 57.0 | | 51 | 59 | 47 | |
| 7 | .794 | .800 | .806 | 53 | 63 | 55 | 54 | 69 | 57 | 60.0 | | 49 | 58 | 49 | |
| 8 | .814 | .818 | .826 | 54 | 61 | 54 | 52 | 63 | 51 | 55.3 | | 51 | 57 | 49 | |
| 9 | .820 | .824 | .808 | 55 | 61 | 55 | 54 | 62 | 50 | 55.3 | | 52 | 58 | 48 | |
| 10 | .806 | .800 | .802 | 52 | 62 | 55 | 54 | 63½ | 53 | 56.8 | | 51 | 59 | 51 | |
| 11 | .814 | .822 | .844 | 55 | 61 | 58 | 55 | 60 | 55 | 56.7 | | 53 | 58 | 55 | |
| 12 | .830 | .830 | .834 | 56 | 60 | 57 | 51 | 61 | 56 | 56.0 | | 50 | 58 | 53 | |
| 13 | .804 | .810 | .810 | 54 | 61 | 56 | 56 | 59 | 52 | 55 7 | | 48 | 58 | 50 | |
| 14 | .820 | .816 | .820 | 55 | 59 | 55 | 52 | 61 | 53 | 55.3 | | 42 | 54 | 50 | |
| 15 | .822 | .810 | .816 | 53 | 62 | 56 | 54 | 62 | 53 | 56.3 | | 50 | 58 | 50 | |
| 16 | .808 | .812 | .810 | 55 | 62 | 59 | 57½ | 64 | 57 | 59.5 | | 54½ | 59 | 55 | |
| 17 | .812 | .815 | .829 | 57 | 65 | 60 | 57 | 69 | 57 | 61 0 | | 55 | 62 | 55 | |
| 18 | .839 | .832 | .842 | 58 | 64 | 59 | 58 | 63 | 54 | 58.3 | | 55½ | 59 | 53 | |
| 19 | .822 | .818 | .814 | 57 | 64 | 57 | 58 | 66 | 55 | 59.7 | | 53 | 61 | 52 | |
| 20 | .807 | .810 | .802 | 56 | 62 | 57 | 56 | 61½ | 55 | 57.5 | | 54½ | 59 | 51 | |
| 21 | .808 | .805 | .800 | 55 | 61 | 57 | 54½ | 61½ | 55 | 57.0 | | 52 | 59 | 53 | |
| 22 | .800 | .796 | .796 | 57 | 61 | 56 | 57½ | 63 | 54 | 58.2 | | 54 | 58 | 52 | |
| 23 | .788 | .784 | .792 | 55 | 61 | 58 | 56 | 61½ | 56 | 57.8 | | 54 | 59 | 54 | |
| 24 | .790 | .785 | .798 | 58 | 62 | 58 | 56 | 61 | 56½ | 57.8 | | 55 | 58½ | 55 | |
| 25 | .778 | .768 | .762 | 58 | 61 | 59 | 60 | 62 | 57½ | 59.8 | | 58 | 59 | 56 | |
| 26 | .764 | .760 | .768 | 58 | 61 | 60 | 55 | 62 | 57 | 58.0 | | 54 | 58 | 56 | |
| 27 | .778 | .788 | .800 | 59 | 63 | 60 | 56 | 66 | 59 | 60.3 | | 56 | 60 | 57 | |
| 28 | .804 | .812 | .828 | 58 | 63 | 61 | 57 | 66 | 60 | 61.0 | | 55 | 60 | 58 | |
| 29 | .832 | .818 | .840 | 60 | 60 | 59 | 59 | 60 | 57 | 58.7 | | 59 | 57 | 56 | |
| 30 | .844 | .820 | .826 | 58 | 64 | 60 | 59 | 68 | 58 | 61.7 | | 57 | 59½ | 56 | |
| 31 | .812 | .794 | .806 | 59 | 62 | 60 | 57 | 61 | 59 | 59.0 | | 56 | 59 | 57 | *Lightning and thunder of short duration. |
| Total... | 25.046 | 24.935 | 25.098 | ..... | ..... | ..... | 1726.5 | 1958 | 1712 | 1798.7 | ..... | 1650.5 | 1812 | 1639 | |
| Mean... | 23.808 | 23.804 | 23.810 | ..... | ..... | ..... | 55.7 | 63.2 | 55.2 | 58.0 | ..... | 53.2 | 58.4 | 52.9 | |
| | 23.807 | | | | | | 58.0 | | | | | 54.8 | | | |

* .200 too low; barometer defective.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. Feb. 24 | 7.55 a. m.<br>11.15 a. m. | 8.15 a. m.<br>6.30 p. m. | 4 | ..... | ..... | ..... | 10 | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | 2.55 p. m.<br>5.15 p. m. | 3.10 p. m.<br>5.45 p. m. | 2 | ..... | ..... | ..... | 8 | E. ..... | 1 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 26 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | N.....<br>S. .....<br>E..... | 2<br>2<br>2½ | Upper...<br>Middle .<br>Lower . | 1 | ..... | ..... | ..... | ..... | ..... | N..... | 3 | W .... | 4 |
| 27 | ..... | ..... | 9 | N..... | 2½ | ..... | 9 | N. ..... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W ... | 2 |
| 28 | 12.15 p. m. | 12.30 p. m. | 1 | ..... | ..... | ..... | 10 | SE..... | 2 | Fog..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 2 |
| Total... | ..... | ..... | 135 | ..... | ..... | ..... | 262 | ..... | ..... | ..... | 89 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 4.8 | ..... | ..... | ..... | 9.4 | ..... | ..... | ..... | 3.2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | ..... | ..... | 8 | W.NW... | 2 | Higher. | 7 | S.W..... | 2 | Higher .. | 10 | S.SE .... | 2 | ..... | ..... | ..... | ..... | ..... | Calm .. | ..... |
| | | | | SE ..... | 2½ | Lower. | | S..... | | ..... | | | | | | | | | | |
| 31 | 9.40 p. m.. | 3.15 p. m.. | 9 | W..... | 2 | Higher. | 9 | NW..... | 2 | Higher .. | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 5.25 p. m.. | 6.10 p. m.. | ..... | S ..... | 3 | Middle. | ..... | S..... | 3 | Lower .. | | | | | | | | | | |
| | | | | E ..... | 2 | Lower. | | | | | | | | | | | | | | |
| Mean .. | ..... | ..... | 169 | ..... | ..... | ..... | 262 | ..... | ..... | ..... | 124 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total ... | ..... | ..... | 5 5 | ..... | ..... | ..... | 8.5 | ..... | ..... | ..... | 4.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Barometer.* Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| April 1 | 23.792 | 23.788 | 23.798 | 60 | 63 | 58 | 58 | 60 | 57 | 58.3 | The same as thermometer in open air. | 56½ | 59½ | 54 | Lightning without thunder 2.25 p. m.—2.55 p. m. |
| 2 | .798 | .820 | .819 | 57 | 64 | 55 | 58 | 66 | 53 | 59.0 | | 55½ | 60 | 47 | |
| 3 | .809 | .828 | .824 | 56 | 66 | 58 | 57 | 67 | 56 | 60.0 | | 52 | 60 | 51 | |
| 4 | .800 | .812 | .810 | 55 | 64 | 59 | 55 | 65 | 56 | 58.7 | | 51 | 59 | 54 | Therm. 50° at 6 a. m. |
| 5 | .788 | .792 | .796 | 56 | 63 | 59 | 56 | 65 | 56 | 59.0 | | 54 | 59 | 54 | |
| 6 | .791 | .788 | .800 | 58 | 65 | 60 | 60 | 67 | 57 | 61.3 | | 57 | 60 | 55 | |
| 7 | .788 | .792 | .790 | 59 | 63 | 59 | 59 | 62 | 55 | 58.7 | | 56 | 59 | 53 | |
| 8 | .784 | .781 | .790 | 56 | 65 | 60 | 58 | 69 | 58 | 61.3 | | 55 | 59 | 55 | |
| 9 | .792 | .784 | .794 | 59 | 65 | 62 | 58 | 70 | 59 | 62.3 | | 56 | 61 | 56 | |
| 10 | .784 | .788 | .810 | 60 | 65 | 62 | 57 | 67 | 59 | 61.0 | | 56 | 60 | 58 | |
| 11 | .800 | .803 | .814 | 58 | 62 | 61 | 55 | 62 | 59 | 58.7 | | 55 | 59 | 58 | |
| 12 | .812 | .814 | .840 | 59 | 58 | 57 | 57 | 57 | 58 | 57.3 | | 57 | 56½ | 56 | |
| 13 | .842 | .836 | .854 | 57 | 61 | 60 | 5[illegible] | 65 | 58 | 59.3 | | 55 | 62 | 57 | |
| 14 | .842 | .820 | .834 | 57 | 64 | 59 | 55 | 72 | 57 | 61.3 | | 54 | 62 | 55 | |
| 15 | .829 | .810 | .818 | 57 | 63 | 59 | 56 | 64 | 57 | 59.0 | | 55 | 58 | 55 | |
| 16 | .800 | .803 | .811 | 57 | 62 | 60 | 57 | 60 | 57 | 58.0 | | 52 | 57 | 56 | |
| 17 | .806 | .800 | .812 | 59 | 64 | 60 | 57 | 66 | 59 | 60.7 | | 55½ | 60 | 57 | |
| 18 | .800 | .800 | .806 | 57 | 62 | 59 | 57 | 63½ | 56 | 58.8 | | 55 | 60½ | 53 | |
| 19 | .794 | .802 | .800 | 59 | 63 | 59 | 58½ | 62 | 55 | 58.5 | | 55½ | 57 | 53 | |
| 20 | .796 | .792 | .794 | 56 | 63 | 58 | 60 | 64½ | 54 | 59.5 | | 55 | 60½ | 51 | |
| 21 | .794 | .782 | .798 | 56 | 64 | 59 | 59 | 67 | 56 | 60.7 | | 53 | 59 | 54½ | |
| 22 | .802 | .809 | .834 | 59 | 63 | 61 | 58½ | 63 | 59 | 60.0 | | 56 | 58½ | 56 | |
| 23 | .826 | .832 | .856 | 58 | 63 | 61 | 57 | 65 | 59 | 60.3 | | 56 | 60 | 58 | Thunder, muttering, at 6 p. m. |
| 24 | .798 | .836 | .850 | 57 | 63 | 59 | 56 | 66 | 56 | 59.3 | | 55 | 59 | 53 | |
| 25 | .823 | .814 | .808 | 58 | 63 | 59 | 60 | 63 | 56½ | 59.8 | | 57½ | 59 | 55 | |
| 26 | .809 | .806 | .812 | 59 | 65 | 59 | 59 | 70 | 55 | 61.3 | | 56 | 57 | 52 | |
| 27 | .822 | .832 | .834 | 57 | 65 | 59 | 59 | 67 | 58 | 61.3 | | 55 | 59 | 54 | |
| 28 | .822 | .820 | .814 | 59 | 65 | 58 | 62 | 68 | 57 | 62.3 | | 57 | 58 | 54 | |
| 29 | .834 | .826 | .822 | 58 | 66 | 59 | 59 | 68 | 56 | 61.0 | | 55 | 56 | 54 | |
| 30 | .828 | .820 | .820 | 59 | 63 | 59 | 58 | 64 | 57 | 59.7 | | 56 | 59 | 56 | Thunder. |
| Total..... | 24.205 | 24.233 | 24.462 | ..... | ..... | ..... | 1731 | 1955 | 1705½ | 1796.4 | ..... | 1654.5 | 1773.5 | 1634.5 | |
| Mean..... | 23.807 | 23.808 | 23.815 | ..... | ..... | ..... | 57.7 | 65.2 | 56.8 | 59.9 | ..... | 55.1 | 59.1 | 54.5 | |
| | 23.810 | | | | | | 59.9 | | | | | 56.2 | | | |

* .200 too low; barometer defective.

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 5 a. m. | 8.30 a. m. | 10 | E.SE. | 2 | ..... | 10 | SE. | 2½ | Fog | 10 | ..... | | | | | | | | | |
| 30 | ..... | ..... | 8 | W.NW. | 2 | Higher. | 7 | NW. | 1 | Higher | 10 | S.SE. | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | SE. | 2½ | Lower. | | S. | 2 | ..... | | | | | | | | | | | |
| 31 | 2.40 p. m. | 3.15 p. m. | 9 | W. | 2 | Higher. | 9 | NW. | 2 | Higher | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 5.25 p. m. | 6.10 p. m. | ..... | S. | 3 | Middle. | ..... | S. | 3 | Lower | | | | | | | | | | | |
| | | | | E. | 2 | Lower. | | | | | | | | | | | | | | | |
| Mean | ..... | ..... | 169 | ..... | ..... | ..... | 262 | ..... | ..... | ..... | 124 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total | ..... | ..... | 5.5 | ..... | ..... | ..... | 8.5 | ..... | ..... | ..... | 4.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Barometer.* Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| April 1 | 23.792 | 23.788 | 23.798 | 60 | 63 | 58 | 58 | 60 | 57 | 58.3 | The same as thermometer in open air. | 56½ | 59½ | 54 | Lightning without thunder 2.25 p. m.—2.55 p. m. |
| 2 | .798 | .820 | .819 | 57 | 64 | 55 | 58 | 66 | 53 | 59.0 | | 55½ | 60 | 47 | |
| 3 | .809 | .828 | .834 | 56 | 66 | 58 | 57 | 67 | 56 | 60.0 | | 52 | 60 | 51 | |
| 4 | .800 | .812 | .810 | 55 | 64 | 59 | 55 | 65 | 56 | 58.7 | | 51 | 59 | 54 | Therm. 50° at 6 a. m. |
| 5 | .788 | .792 | .796 | 56 | 63 | 59 | 56 | 65 | 56 | 59.0 | | 54 | 59 | 54 | |
| 6 | .791 | .788 | .800 | 58 | 65 | 60 | 60 | 67 | 57 | 61.3 | | 57 | 60 | 55 | |
| 7 | .788 | .792 | .790 | 59 | 63 | 59 | 59 | 62 | 55 | 58.7 | | 56 | 59 | 53 | |
| 8 | .784 | .784 | .790 | 56 | 65 | 60 | 58 | 69 | 58 | 61.3 | | 55 | 59 | 55 | |
| 9 | .792 | .784 | .794 | 59 | 65 | 62 | 58 | 70 | 59 | 62.3 | | 56 | 61 | 56 | |
| 10 | .784 | .788 | .810 | 60 | 65 | 62 | 57 | 67 | 59 | 61.0 | | 56 | 60 | 58 | |
| 11 | .800 | .803 | .814 | 58 | 62 | 61 | 55 | 62 | 59 | 58.7 | | 55 | 59 | 58 | |
| 12 | .812 | .814 | .840 | 59 | 58 | 57 | 57 | 57 | 58 | 57.3 | | 57 | 56½ | 56 | |
| 13 | .842 | .836 | .854 | 57 | 61 | 60 | 5[illegible] | 65 | 58 | 59.3 | | 55 | 62 | 57 | |
| 14 | .842 | .820 | .834 | 57 | 64 | 59 | 55 | 72 | 57 | 61.3 | | 54 | 62 | 55 | |
| 15 | .829 | .810 | .818 | 57 | 63 | 59 | 56 | 64 | 57 | 59.0 | | 55 | 58 | 55 | |
| 16 | .800 | .803 | .811 | 57 | 62 | 60 | 57 | 60 | 57 | 58.0 | | 52 | 57 | 56 | |
| 17 | .806 | .800 | .812 | 59 | 64 | 60 | 57 | 66 | 59 | 60.7 | | 55½ | 60 | 57 | |
| 18 | .800 | .800 | .806 | 57 | 62 | 59 | 57 | 63½ | 56 | 58.8 | | 55 | 60½ | 53 | |
| 19 | .794 | .802 | .800 | 59 | 63 | 59 | 58½ | 62 | 55 | 58.5 | | 55½ | 57 | 53 | |
| 20 | .796 | .792 | .794 | 56 | 63 | 58 | 60 | 64½ | 54 | 59.5 | | 55 | 60½ | 51 | |
| 21 | .794 | .782 | .798 | 56 | 64 | 59 | 59 | 67 | 56 | 60.7 | | 53 | 59 | 54½ | |
| 22 | .802 | .809 | .834 | 59 | 63 | 61 | 58½ | 63 | 59 | 60.0 | | 56 | 58½ | 56 | |
| 23 | .826 | .832 | .856 | 58 | 63 | 61 | 57 | 65 | 59 | 60.3 | | 56 | 60 | 58 | Thunder, muttering, at 6 p. m. |
| 24 | .798 | .836 | .850 | 57 | 63 | 59 | 56 | 66 | 56 | 59.3 | | 55 | 59 | 53 | |
| 25 | .823 | .814 | .808 | 58 | 63 | 59 | 60 | 63 | 56½ | 59.8 | | 57½ | 59 | 55 | |
| 26 | .809 | .806 | .812 | 59 | 65 | 59 | 59 | 70 | 55 | 61.3 | | 56 | 57 | 52 | |
| 27 | .822 | .832 | .834 | 57 | 65 | 59 | 59 | 67 | 58 | 61.3 | | 55 | 59 | 54 | |
| 28 | .822 | .820 | .814 | 59 | 65 | 58 | 62 | 68 | 57 | 62.3 | | 57 | 58 | 54 | |
| 29 | .834 | .826 | .822 | 58 | 66 | 59 | 59 | 68 | 56 | 61.0 | | 55 | 56 | 54 | |
| 30 | .828 | .820 | .820 | 59 | 63 | 59 | 58 | 64 | 57 | 59.7 | | 56 | 59 | 56 | Thunder. |
| Total..... | 24.205 | 24.233 | 24.462 | ..... | ..... | ..... | 1731 | 1955 | 1705½ | 1796.4 | ..... | 1654.5 | 1773.5 | 1634.5 | |
| Mean..... | 23.807 | 23.808 | 23.815 | ..... | ..... | ..... | 57.7 | 65.2 | 56.8 | 59.9 | ..... | 55.1 | 59.1 | 54.5 | |
| | 23.810 | | | | | | 59.9 | | | | | 56.2 | | | |

* .200 too low; barometer defective.

| Date. | Barometer.* Height. 7 A. M. | Height. 2 P. M. | Height. 9 P. M. | Barometer.* Thermometer attached. 7 A. M. | Thermometer attached. 2 P. M. | Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Wet bulb. 2 P. M. | Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| May 1 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 60 | 56 | 57.3 | Same as thermometer in open air. | 54 | 59 | 53 | |
| 2 | ..... | ..... | ..... | ..... | ..... | ..... | 58 | 60 | 57 | 58.3 | | 56 | 58 | 56 | |
| 3 | ..... | ..... | ..... | ..... | ..... | ..... | 55 | 58 | 57 | 56.7 | | 55 | 57 | 53 | |
| 4 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 64 | 58 | 59.7 | | 54 | 60 | 57 | Thunder, faint. |
| 5 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 61 | 55 | 57.7 | | 56 | 59 | 54 | |
| 6 | ..... | ..... | ..... | ..... | ..... | ..... | 59 | 62 | 56 | 59.0 | | 55 | 61 | 56 | |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 61 | 55 | 57.3 | | 55½ | 59 | 55 | |
| 8 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 59 | 58 | 57.7 | | 56 | 58 | 57 | |
| 9 | 23.988 | 23.986 | 23.988 | 59 | 63 | 60 | 57 | 64 | 59 | 60.0 | | 56½ | 60 | 58 | |
| 10 | .980 | .958 | .974 | 59 | 63 | 60 | 58 | 64½ | 59 | 60.5 | | 57 | 59½ | 57½ | |
| 11 | .976 | .956 | .984 | 59 | 63 | 59 | 59 | 63 | 57 | 59.7 | | 58 | 59 | 55 | |
| 12 | .983 | .976 | 24.003 | 60 | 60 | 58 | 61 | 60½ | 58 | 59.8 | | 59 | 60 | 57 | |
| 13 | .980 | .968 | 24.006 | 59 | 60 | 59 | 58 | 59½ | 58 | 58.3 | | 58 | 59 | 58 | |
| 14 | 24.004 | .972 | 23.994 | 58 | 61 | 58 | 57 | 62 | 57 | 58.7 | | 57 | 61 | 56½ | |
| 15 | 23.986 | .964 | .994 | 58 | 59 | 58 | 56½ | 59 | 57 | 57.5 | | 56 | 57 | 56 | |
| 16 | .988 | .963 | .980 | 58 | 63 | 60 | 56 | 62 | 58 | 58.7 | | 56 | 58 | 58 | |
| 17 | .995 | .980 | 24.012 | 58 | 62 | 59 | 57 | 63 | 58 | 59.3 | | 56 | 60 | 56½ | |
| 18 | 24.004 | .974 | 24.000 | 58 | 60 | 57 | 57½ | 59 | 56 | 57.5 | | 56 | 58 | 55 | |
| 19 | 23.978 | .968 | 24.010 | 58 | 62 | 60 | 58 | 62 | 59 | 59.7 | | 57 | 59 | 58 | |
| 20 | .990 | .970 | 24.000 | 59 | 61 | 59 | 58½ | 61 | 58 | 59.0 | | 58 | 59 | 56 | |
| 21 | .993 | .984 | 23.986 | 58 | 61 | 60 | 58 | 62 | 58 | 59.3 | | 57 | 59 | 57 | |
| 22 | .996 | .984 | 24.000 | 59 | 62 | 59 | 57 | 61½ | 58 | 58.8 | | 57 | 60 | 56 | |
| 23 | .996 | .972 | 24.002 | 59 | 62 | 59 | 59 | 64 | 57 | 60.0 | | 58 | 60 | 55 | |
| 24 | .988 | .973 | 24.002 | 57 | 62 | 61 | 57 | 64 | 60 | 60.3 | | 56 | 61 | 59 | |
| 25 | .988 | .968 | 23.984 | 59 | 62 | 60 | 58½ | 61 | 59 | 59.5 | | 57 | 59½ | 58 | |
| 26 | .980 | .986 | 24.011 | 57 | 62 | 62 | 55½ | 61 | 59 | 58.5 | | 55 | 59 | 59 | |
| 27 | 24.002 | .986 | 24.010 | 59 | 63 | 57 | 59 | 61 | 53 | 57.7 | | 53 | 60 | 52 | |
| 28 | 23.976 | .970 | 23.976 | 59 | 64 | 59 | 59 | 65 | 58 | 60.7 | | 55 | 59 | 57 | |
| 29 | .980 | .941 | .972 | 57 | 63 | 60 | 58 | 65 | 59 | 60.7 | | 56 | 61 | 58 | |
| 30 | .980 | .984 | .974 | 58 | 62 | 57 | 60 | 62 | 55 | 59.0 | | 57 | 59 | 54½ | Thunder, muttering. |
| 31 | .988 | .982 | 24.000 | 57 | 62 | 57 | 57 | 62 | 55 | 58.0 | | 56 | 59 | 54 | |
| Total..... | 91.680 | 1845 | 91.842 | | | | 1785 | 1913 | 1777 | 1824.9 | ..... | 1746 | 1837 | 1741.5 | |
| Mean..... | 23.986 | 23.972 | 23.993 | | | | 57.6 | 61.7 | 57.3 | 58.9 | ..... | 56.3 | 59.3 | 56.2 | |
| | 23.984 | | | | | | 58.9 | | | | | 57.3 | | | |

* Barometer at normal height.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. April 19 | | | 7 | W.<br>W. | 2½<br>2½ | | 7 | E.<br>W | 1<br>3 | | 0 | | | | | | | | S. | 2 |
| 20 | | | 4 | NW. | 3 | | 8 | NW. | 2 | | 1 | | | | | | | | | |
| 21 | | | 1 | | | | 7 | W.<br>S.<br>E. | 2<br>2<br>2½ | High<br>Middle<br>Low | 1 | | | | | | | | W. | 2 |
| 22 | | | 6 | S. | 2 | | 10 | S. | 2 | | 8 | | | | | | | | W. | 2 |
| 23 | 6.20 p m. | 6.45 p m. | 9 | SE. | 3 | | 7 | W.<br>S. | 2<br>3 | High<br>Low | 10 | | | | | | | | | |
| 24 | | | 10 | S.SE. | 2 | | 7 | N.<br>S SE. | 1<br>3 | | 0 | | | | | | | | W. | 2 |
| 25 | | | 3 | W. | 2 | | 9 | N.<br>S. | 1<br>2½ | | 2 | | | | | | | | W. | 2 |
| 26 | | | 6 | N.<br>SW. | 2½<br>2 | | 3 | S. | 2 | | 0 | | | | | | | | W. | 2 |
| 27 | | | 2 | W. | 1 | | 6 | SE<br>S. | 2<br>2½ | | 3 | S. | 2 | | | | | | W. | 2 |
| 28 | | | 3 | SW. | 2 | | 6 | NE.<br>S. | 1<br>2 | | 0 | | | | | | | | W. | 2 |
| 29 | | | 3 | S. | 2½ | | 3 | S. | 2 | | 0 | | | | | | | | W. | 2 |
| 30 | 6.15 p.m. | 11 p.m. | 9 | S.<br>S. | 2<br>3 | Higher.<br>Lower. | 8 | Station<br>S. | <br>3 | High<br>Low | 10 | | | | | | | | | |
| Total. | | | 203 | | | | 220 | | | | 105 | | | | | | | | | |
| Mean. | | | 6.7 | | | | 7.3 | | | | 3.5 | | | | | | | | | |

| Date. | Barometer.* Height. 7 A. M. | Barometer.* Height. 2 P. M. | Barometer.* Height. 9 P. M. | Barometer.* Thermometer attached. 7 A. M. | Barometer.* Thermometer attached. 2 P. M. | Barometer.* Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| May 1 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 60 | 56 | 57 3 | Same as thermometer in open air. | 54 | 59 | 53 | |
| 2 | ..... | ..... | ..... | ..... | ..... | ..... | 58 | 60 | 57 | 58.3 | | 56 | 58 | 56 | |
| 3 | ..... | ..... | ..... | ..... | ..... | ..... | 55 | 58 | 57 | 56.7 | | 55 | 57 | 53 | |
| 4 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 64 | 58 | 59.7 | | 54 | 60 | 57 | Thunder, faint. |
| 5 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 61 | 55 | 57.7 | | 56 | 59 | 54 | |
| 6 | ..... | ..... | ..... | ..... | ..... | ..... | 59 | 62 | 56 | 59.0 | | 55 | 61 | 56 | |
| 7 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 61 | 55 | 57.3 | | 55½ | 59 | 55 | |
| 8 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 59 | 58 | 57.7 | | 56 | 58 | 57 | |
| 9 | 23.988 | 23.986 | 23.988 | 59 | 63 | 60 | 57 | 64 | 59 | 60.0 | | 56½ | 60 | 58 | |
| 10 | .980 | .958 | .974 | 59 | 63 | 60 | 58 | 64½ | 59 | 60.5 | | 57 | 59½ | 57½ | |
| 11 | .976 | .956 | .984 | 59 | 63 | 59 | 59 | 63 | 57 | 59.7 | | 58 | 59 | 55 | |
| 12 | .983 | .976 | 24.003 | 60 | 60 | 58 | 61 | 60½ | 58 | 59.8 | | 59 | 60 | 57 | |
| 13 | .980 | .968 | 24.006 | 59 | 60 | 59 | 58 | 59½ | 58 | 58.3 | | 58 | 59 | 58 | |
| 14 | 24.004 | .972 | 23.994 | 58 | 61 | 58 | 57 | 62 | 57 | 58.7 | | 57 | 61 | 56½ | |
| 15 | 23.986 | .964 | .994 | 58 | 59 | 58 | 56½ | 59 | 57 | 57.5 | | 56 | 57 | 56 | |
| 16 | .988 | .963 | .960 | 58 | 63 | 60 | 56 | 62 | 58 | 58 7 | | 56 | 58 | 58 | |
| 17 | .993 | .980 | 24.012 | 58 | 62 | 59 | 57 | 63 | 58 | 59.3 | | 56 | 60 | 56½ | |
| 18 | 24.004 | .974 | 24.000 | 58 | 60 | 57 | 57½ | 59 | 56 | 57.5 | | 56 | 58 | 55 | |
| 19 | 23.978 | .968 | 24.010 | 58 | 62 | 60 | 58 | 62 | 59 | 59.7 | | 57 | 59 | 58 | |
| 20 | .990 | .970 | 24.000 | 59 | 61 | 59 | 58½ | 61 | 58 | 59.0 | | 58 | 59 | 56 | |
| 21 | .993 | .984 | 23.986 | 58 | 61 | 60 | 58 | 62 | 58 | 59.3 | | 57 | 59 | 57 | |
| 22 | .996 | .984 | 24.000 | 59 | 62 | 59 | 57 | 61½ | 58 | 58.8 | | 57 | 60 | 56 | |
| 23 | .996 | .972 | 24.002 | 59 | 62 | 59 | 59 | 64 | 57 | 60.0 | | 58 | 60 | 55 | |
| 24 | .988 | .973 | 24.002 | 57 | 62 | 61 | 57 | 64 | 60 | 60.3 | | 56 | 61 | 59 | |
| 25 | .988 | .968 | 23.984 | 59 | 62 | 60 | 58½ | 61 | 59 | 59.5 | | 57 | 59½ | 58 | |
| 26 | .980 | .986 | 24.011 | 57 | 62 | 62 | 55½ | 61 | 59 | 58.5 | | 55 | 59 | 59 | |
| 27 | 24.002 | .986 | 24.010 | 59 | 63 | 57 | 59 | 61 | 53 | 57.7 | | 53 | 60 | 52 | |
| 28 | 23.976 | .970 | 23.976 | 59 | 64 | 59 | 59 | 65 | 58 | 60.7 | | 55 | 59 | 57 | |
| 29 | .960 | .941 | .972 | 57 | 63 | 60 | 58 | 65 | 59 | 60.7 | | 56 | 61 | 58 | |
| 30 | .960 | .964 | .974 | 58 | 62 | 57 | 60 | 62 | 55 | 59.0 | | 57 | 59 | 54½ | Thunder, muttering. |
| 31 | .988 | .982 | 24.000 | 57 | 62 | 57 | 57 | 62 | 55 | 58.0 | | 56 | 59 | 54 | |
| Total..... | 91.680 | 1645 | 91.842 | | | | 1785 | 1913 | 1777 | 1824.9 | ..... | 1746 | 1837 | 1741.5 | |
| Mean..... | 23.986 | 23.972 | 23.993 | | | | 57.6 | 61 7 | 57.3 | 58.9 | ..... | 56 3 | 59.3 | 56.2 | |
| | 23.984 | | | | | | 58.9 | | | | | 57.3 | | | |

* Barometer at normal height.

## HALF-HOURLY BAROMETRICAL OBSERVATIONS—*for seven days, from May* 10, 1857, *to May* 16, *inclusive.*

| | 6½ A. M. | | 7 A. M. | | 7½ A. M. | | 8 A. M. | | 8½ A. M. | | 9 A. M. | | 9½ A. M. | | 10 A. M. | | 10½ A. M. | | 11 A. M. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. |
| May 10 | 23.978 | 59 | 23.980 | 59 | 23.982 | 59 | 23.983 | 59 | 23.986 | 59 | 23.995 | 60 | 23.997 | 61 | 24.000 | 61 | *24.001 | 62 | 24.000 | 63 |
| 11 | .964 | 59 | .976 | 59 | .978 | 59 | .983 | 59 | .988 | 59 | .992 | 60 | .994 | 60 | 23.994 | 60 | *23.996 | 60 | 23.992 | 61 |
| 12 | .969 | 60 | .983 | 60 | .992 | 61 | 24.004 | 61 | 24.010 | 61 | 24.012 | 62 | 24.016 | 62 | *24.016 | 61 | *24.016 | 61 | 24.010 | 60 |
| 13 | .973 | 59 | .980 | 59 | .984 | 59 | 23.988 | 59 | 23.992 | 59 | 23.998 | 59 | 24.000 | 59 | *24.004 | 59 | 24.002 | 59 | 23.998 | 59 |
| 14 | .996 | 58 | 24.004 | 58 | 24.006 | 58 | 24.008 | 58 | *24.018 | 58 | *24.018 | 58 | *24.018 | 58 | 24.012 | 59 | 24.012 | 59 | 24.005 | 59 |
| 15 | .976 | 58 | 23.986 | 58 | 23.992 | 58 | 23.996 | 57 | 24.000 | 57 | *24.009 | 57 | 24.004 | 57 | 24.008 | 57 | 24.003 | 57 | 24.000 | 57 |
| 16 | .970 | 57 | .988 | 57 | .992 | 57 | .996 | 57* | 24.000 | 57 | 24.002 | 58 | 24.006 | 58 | *24.008 | 58 | 24.004 | 59 | 24.004 | 60 |
| Mean.. | 23.975 | ..... | 23.985 | ..... | 23.989 | ..... | 23.994 | ..... | 23.999 | ..... | 24.004 | ..... | 24.005 | ..... | *24.006 | ..... | 24.005 | ..... | 24.001 | ... |

## HALF-HOURLY BAROMETRICAL OBSERVATIONS—Continued.

| | 11½ A. M. | | 12 M. | | 12½ P. M. | | 1 P. M. | | 1½ P. M. | | 2 P. M. | | 2½ P. M. | | 3 P. M. | | 3½ P. M. | | 4 P. M. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. | | T°. |
| May 10 | 24.000 | 63 | 23.990 | 63 | 23.985 | 63 | 23.974 | 63 | 23.962 | 63 | 23.958 | 63 | 23.953 | 63 | 23.944 | 64 | 23.940 | 64 | 23.938 | 64 |
| 11 | 23.988 | 61 | .982 | 61 | .978 | 62 | .968 | 62 | .960 | 62 | .956 | 63 | .948 | 63 | .946 | 63 | .940 | 62 | .934 | 62 |
| 12 | 24.004 | 60 | 24.000 | 60 | .992 | 60 | .984 | 60 | .981 | 60 | .976 | 60 | .976 | 60 | .968 | 60 | .961 | 62 | .956 | 60 |
| 13 | 23.996 | 59 | 23.993 | 59 | .988 | 60 | .984 | 60 | .972 | 60 | .968 | 60 | .964 | 60 | .962 | 60 | .960 | 60 | *.956 | 60 |
| 14 | 24.008 | 59 | 24.002 | 59 | .994 | 59 | .985 | 60 | .982 | 60 | .972 | 61 | .968 | 61 | .965 | 61 | .960 | 61 | .958 | 61 |
| 15 | 24.000 | 58 | 23.998 | 58 | .990 | 59 | .983 | 59 | .977 | 59 | .964 | 59 | .956 | 60 | .955 | 59 | .948 | 59 | .946 | 59 |
| 16 | 23.998 | 60 | .990 | 60 | .986 | 60 | .980 | 61 | .975 | 63 | .963 | 63 | .958 | 63 | .948 | 62 | .947 | 62 | *.940 | 62 |
| Mean... | 23.999 | ..... | 23.994 | ..... | 23.988 | ..... | 23.980 | ..... | 23.973 | .... | 23.965 | ..... | 23.960 | ..... | 23.955 | ..... | 23.951 | ..... | 23.947 | .... |

The numbers marked thus * are the maximums and the minimums of the day.

| | 4½ P. M. | | 5 P. M. | | 5½ P. M. | | 6 P. M. | | 6½ P. M. | | 7 P. M. | | 7½ P. M. | | 8 P. M. | | 8½ P. M. | | 9 P. M. | | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | |
| May 10 | *23.937 | 64 | 23.937 | 63 | 23.939 | 62 | 23.941 | 61 | 23.942 | 61 | 23.946 | 61 | 23.951 | 61 | 23.960 | 61 | 23.968 | 60 | 23.974 | 60 | .064 |
| 11 | *.932 | 62 | .938 | 62 | .942 | 62 | .944 | 62 | .950 | 61 | .956 | 60 | .964 | 60 | .978 | 60 | .983 | 59 | .984 | 59 | .064 |
| 12 | *.953 | 60 | .956 | 60 | .960 | 59 | .963 | 59 | .970 | 59 | .974 | 58 | .980 | 58 | .988 | 58 | .996 | 59 | 24.003 | 58 | .063 |
| 13 | *.956 | 60 | *.956 | 60 | *.956 | 60 | .960 | 60 | .966 | 60 | .978 | 60 | .988 | 59 | .992 | 59 | 24.004 | 59 | 24.006 | 59 | .048 |
| 14 | *.958 | 60 | *.958 | 60 | .959 | 60 | .964 | 59 | .968 | 59 | .980 | 59 | .982 | 59 | .986 | 58 | 23.990 | 58 | 23.994 | 58 | .060 |
| 15 | *.945 | 59 | .956 | 59 | .960 | 58 | .961 | 58 | .965 | 58 | .974 | 58 | .980 | 58 | .982 | 58 | .992 | 58 | 23.994 | 58 | .064 |
| 16 | *.940 | 62 | .942 | 61 | .944 | 60 | .948 | 60 | .952 | 59 | .958 | 59 | .960 | 60 | .974 | 60 | .984 | 60 | .988 | 60 | .068 |
| Mean.. | *23.946 | ..... | 23.949 | .... | 23.951 | ..... | 23.954 | ..... | 23.959 | ..... | 23.967 | ..... | 23.973 | ..... | 23.980 | .... | 23.988 | .... | 23.992 | ..... | .061 |

The numbers marked thus * are the maximums and the minimums of the day.

## HALF-HOURLY BAROMETRICAL OBSERVATIONS—*for seven days, from May* 10, 1857, *to May* 16, *inclusive.*

| | 6½ A. M. | | 7 A. M. | | 7½ A. M. | | 8 A. M. | | 8½ A. M. | | 9 A. M. | | 9½ A. M. | | 10 A. M. | | 10½ A. M. | | 11 A. M. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. |
| May 10 | 23.978 | 59 | 23.980 | 59 | 23.982 | 59 | 23.983 | 59 | 23.986 | 59 | 23.995 | 60 | 23.997 | 61 | 24.000 | 61 | *24.001 | 62 | 24.000 | 63 |
| 11 | .964 | 59 | .976 | 59 | .978 | 59 | .983 | 59 | .988 | 59 | .992 | 60 | .994 | 60 | 23.994 | 60 | *23.996 | 60 | 23.992 | 61 |
| 12 | .969 | 60 | .983 | 60 | .992 | 61 | 24.004 | 61 | 24.010 | 61 | 24.012 | 62 | 24.016 | 62 | *24.016 | 61 | *24.016 | 61 | 24.010 | 60 |
| 13 | .973 | 59 | .980 | 59 | .984 | 59 | 23.988 | 59 | 23.992 | 59 | 23.998 | 59 | 24.000 | 59 | *24.004 | 59 | 24.002 | 59 | 23.998 | 59 |
| 14 | .996 | 58 | 24.004 | 58 | 24.006 | 58 | 24.008 | 58 | *24.018 | 58 | *24.018 | 58 | *24.018 | 58 | 24.012 | 59 | 24.012 | 59 | 24.005 | 59 |
| 15 | .976 | 58 | 23.986 | 58 | 23.992 | 58 | 23.996 | 57 | 24.000 | 57 | *24.009 | 57 | 24.004 | 57 | 24.008 | 57 | 24.003 | 57 | 24.000 | 57 |
| 16 | .970 | 57 | .988 | 57 | .992 | 57 | .996 | 57* | 24.000 | 57 | 24.002 | 58 | 24.006 | 58 | *24.008 | 58 | 24.004 | 59 | 24.004 | 60 |
| Mean.. | 23.975 | ..... | 23.985 | ..... | 23,989 | ..... | 23.994 | ..... | 23.999 | ..... | 24.004 | ..... | 24.005 | ..... | *24.006 | ..... | 24.005 | ..... | 24.001 | ... |

## HALF-HOURLY BAROMETRICAL OBSERVATIONS—Continued.

| | 11½ A. M. | | 12 M. | | 12½ P. M. | | 1 P. M. | | 1½ P. M. | | 2 P. M. | | 2½ P. M. | | 3 P. M. | | 3½ P. M. | | 4 P. M. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. | | Th. |
| May 10 | 24.000 | 63 | 23.990 | 63 | 23.985 | 63 | 23.974 | 63 | 23.962 | 63 | 23.958 | 63 | 23.953 | 63 | 23.944 | 64 | 23.940 | 64 | 23.938 | 64 |
| 11 | 23.988 | 61 | .982 | 61 | .978 | 62 | .968 | 62 | .960 | 62 | .956 | 63 | .948 | 63 | .946 | 63 | .940 | 62 | .934 | 62 |
| 12 | 24.004 | 60 | 24.000 | 60 | .992 | 60 | .984 | 60 | .981 | 60 | .976 | 60 | .976 | 60 | .968 | 60 | .961 | 62 | .956 | 60 |
| 13 | 23.996 | 59 | 23.993 | 59 | .988 | 60 | .984 | 60 | .972 | 60 | .968 | 60 | .964 | 60 | .962 | 60 | .960 | 60 | *.956 | 60 |
| 14 | 24.008 | 59 | 24.002 | 59 | .994 | 59 | .985 | 60 | .982 | 60 | .972 | 61 | .968 | 61 | .965 | 61 | .960 | 61 | .958 | 61 |
| 15 | 24.000 | 58 | 23.998 | 58 | .990 | 59 | .983 | 59 | .977 | 59 | .964 | 59 | .956 | 60 | .955 | 59 | .948 | 59 | .946 | 59 |
| 16 | 23.998 | 60 | .990 | 60 | .986 | 60 | .980 | 61 | .975 | 63 | .963 | 63 | .958 | 63 | .948 | 62 | .947 | 62 | *.940 | 62 |
| Mean... | 23.999 | ..... | 23.994 | ..... | 23.988 | ..... | 23.980 | ..... | 23.973 | .... | 23.965 | ..... | 23.960 | ..... | 23.955 | ..... | 23.951 | ..... | 23.947 | .... |

The numbers marked thus * are the maximums and the minimums of the day.

No. 3.

*xcurrence of rain during the different times of day, recapitulated from table No. 6 e and 6 f.*

| | A. M. | | | | | | M. | P. M. | | | | | Total. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 1 | 2 | 3 | 4 | 5 | 6 | |
| **1856.** | h. | h. | h. | h. | h. | h. | h. | h. | h. | h. | h. | h. | h. | h. |
| y | ---- | $1\frac{6}{12}$ | 2 | 3 | 3 | $3\frac{6}{12}$ | $4\frac{3}{12}$ | $4\frac{6}{12}$ | 8 | 8 | 5 | $2\frac{9}{12}$ | $45\frac{6}{12}$ |
| gust | ---- | ---- | 1 | $2\frac{3}{12}$ | 3 | $2\frac{9}{12}$ | $3\frac{9}{12}$ | $4\frac{9}{12}$ | $8\frac{3}{12}$ | $7\frac{6}{12}$ | $7\frac{6}{12}$ | $3\frac{9}{12}$ | $44\frac{6}{12}$ |
| tember | ---- | $1\frac{3}{12}$ | $1\frac{6}{12}$ | $\frac{9}{12}$ | ---- | $2\frac{6}{12}$ | $6\frac{3}{12}$ | $5\frac{6}{12}$ | 6 | 8 | $5\frac{6}{12}$ | $3\frac{6}{12}$ | $40\frac{9}{12}$ |
| ober | ---- | ---- | ---- | $1\frac{9}{12}$ | $2\frac{9}{12}$ | $3\frac{9}{12}$ | $5\frac{3}{12}$ | $4\frac{10}{12}$ | $5\frac{3}{12}$ | $5\frac{6}{12}$ | $6\frac{6}{12}$ | $8\frac{9}{12}$ | 44 |
| vember | ---- | $\frac{6}{12}$ | 1 | 1 | $\frac{1}{12}$ | $\frac{9}{12}$ | $3\frac{1}{12}$ | $9\frac{4}{12}$ | $8\frac{3}{12}$ | $6\frac{3}{12}$ | $3\frac{6}{12}$ | 3 | $36\frac{7}{12}$ |
| cember | ---- | ---- | $1\frac{3}{12}$ | $1\frac{3}{12}$ | $2\frac{6}{12}$ | 2 | $4\frac{9}{12}$ | $10\frac{9}{12}$ | $12\frac{1}{12}$ | $7\frac{3}{12}$ | $5\frac{6}{12}$ | $5\frac{4}{12}$ | $52\frac{10}{12}$ |
| **1857.** | | | | | | | | | | | | | |
| uary | ---- | 1 | 1 | 1 | 1 | $2\frac{6}{12}$ | 3 | $3\frac{8}{12}$ | $3\frac{3}{12}$ | $3\frac{3}{12}$ | $3\frac{4}{12}$ | $2\frac{3}{12}$ | $25\frac{3}{12}$ |
| ruary | ---- | $\frac{1}{12}$ | 1 | $2\frac{8}{12}$ | $2\frac{11}{12}$ | $4\frac{9}{12}$ | $8\frac{4}{12}$ | $10\frac{3}{12}$ | $8\frac{7}{12}$ | $8\frac{6}{12}$ | $6\frac{10}{12}$ | 5 | $58\frac{3}{12}$ |
| **Total** | ---- | $4\frac{4}{12}$ | $8\frac{9}{12}$ | $13\frac{8}{12}$ | $15\frac{3}{12}$ | $22\frac{6}{12}$ | $38\frac{8}{12}$ | $52\frac{11}{12}$ | $59\frac{7}{12}$ | $54\frac{6}{12}$ | $43\frac{8}{12}$ | $34\frac{4}{12}$ | $348\frac{1}{12}$ |
| | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. | h. m. |
| **Mean** | ---- | 0 32 | 1 5 | 1 42 | 1 54 | 2 49 | 4 50 | 6 37 | 7 27 | 6 48 | 5 27 | 4 17 | 43 31 |
| rch | 1 | 1 | $\frac{6}{12}$ | $\frac{6}{12}$ | ---- | $\frac{6}{12}$ | $\frac{3}{12}$ | $1\frac{1}{12}$ | 1 | $\frac{3}{12}$ | $\frac{3}{12}$ | $\frac{7}{12}$ | $6\frac{11}{12}$ |
| il | 1 | 2 | 2 | $\frac{7}{12}$ | ---- | ---- | ---- | ---- | ---- | ---- | $\frac{3}{12}$ | $\frac{3}{12}$ | 6 |
| y | $4\frac{4}{12}$ | $5\frac{10}{12}$ | $3\frac{10}{12}$ | $5\frac{4}{12}$ | 7 | 7 | $7\frac{9}{12}$ | $8\frac{6}{12}$ | $10\frac{6}{12}$ | 9 | $4\frac{11}{12}$ | 7 | 81 |

No. 4 —*Course of clouds.*

| Month. | E. | E.SE. | SE. | S SE. | S. | S.SW. | SW. | W.SW. | W. | W.NW. | NW. | N.NW. | N. | N.NE. | NE. | E.NE. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1856. | | | | | | | | | | | | | | | | | |
| November | 13 | ..... | 4 | 1 | 6 | ..... | 1 | ..... | 2 | ..... | 1 | ..... | 15 | ..... | 1 | ..... | |
| December | 21 | 6 | 11 | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 6 | ..... | 4 | 2 | |
| 1857. | | | | | | | | | | | | | | | | | |
| January | 6 | 1 | 4 | ..... | 6 | ..... | ..... | ..... | 1 | ..... | 3 | 2 | 16 | ..... | 10 | 1 | |
| February | 11 | 2 | 8 | 1 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11 | ..... | 1 | ..... | |
| March | 14 | 6 | 11 | 5 | 12 | ..... | 1 | ..... | 4 | ..... | 1 | ..... | ..... | ..... | 1 | ..... | |
| April | 1 | ..... | 3 | ..... | 1 | ..... | ..... | 1 | 5 | ..... | ..... | 1 | 7 | 1 | 1 | ..... | High. |
| | 4 | 2 | 5 | 4 | 36 | ..... | 6 | ..... | 6 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | Lower and lowermost. |
| May | ..... | ..... | ..... | ..... | 1 | ..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | High. |
| | 5 | 2 | 10 | 12 | 27 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Lower. |
| | 11 | 3 | 3 | 2 | 3 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Lowermost. |
| Total | 86 | 22 | 59 | 25 | 101 | ..... | 11 | 2 | 19 | ..... | 7 | 3 | 55 | 1 | 18 | 3 | |
| | 293 | | | | | | | | | | | | | | | | |

| Month. | Number of days on which the sky was— | | | | | | No. of rainy days. |
|---|---|---|---|---|---|---|---|
| | Free from clouds. | | | Entirely overcast. | | | |
| | 7 A. M. | 2 P. M. | 9 P. M. | 7 A. M. | 2 P. M. | 9 P. M. | |
| 1856. | | | | | | | |
| June | 0 | 0 | 2 | 7 | 7 | 7 | 19 |
| July | 2 | 1 | 0 | 9 | 11 | 6 | 21 |
| August | 3 | 0 | 5 | 7 | 12 | 9 | 26 |
| September | 0 | 0 | 0 | 10 | 10 | 7 | 22 |
| October | 1 | 0 | 3 | 3 | 9 | 9 | 20 |
| November | 4 | 0 | 14 | 4 | 16 | 3 | 21 |
| December | 8 | 0 | 17 | 5 | 14 | 2 | 21 |
| 1857. | | | | | | | |
| January | 12 | 0 | 22 | 3 | 7 | 0 | 10 |
| February | 4 | 0 | 9 | 4 | 13 | 3 | 20 |
| March | 4 | 0 | 8 | 9 | 14 | 4 | 9 |
| April | 0 | 0 | 7 | 7 | 4 | 3 | 6 |
| May | 0 | 0 | 1 | 16 | 18 | 13 | 25 |

## No. 5.

*Observations on the motion of strata of clouds of different heights at Colonia Tovar.*

| Date. | 7 A. M. | | 9 A. M. | | 12 M. | | 3 P. M. | | 6 P. M. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction. | Force. | Direction. | Force. | Direction. | Force. | Direction. | Force. | Direction. | Force. | |
| 1857. Apl. 3 | W | 1 | W.SW | ½ | | | | | W.SW | 1 | Cir. and very high clouds. |
| | | | | | N.NE | 2½ | N.NE | 2 | N.NE | 2 | Mid. strs. 7,500—9,000 h. |
| | | | Station | | E | 2 | SE | 3 | | | Low. strs. 7,000—7,500 h. |
| 4 | | | | | | | | | Station | | High. |
| | | | | | NW | 2 | | | SE | 2 | Middle. |
| | | | | | SE | 3 | | | SW | 3 | Lower. |
| 5 | | | | | W.SW | 2 | | | | | High. |
| | | | | | | | | | | | Middle. |
| | | | | | S | 3 | S | 3 | | | Lower. |
| 6 | | | W | 1½ | N | 1 | | | | | High. |
| | N.NW | 2 | | | S. & N | 2 | SW | 2 | | | Middle. |
| | S | 3 | N | 3 | S.SW | 3 | S | 3 | | | Lower. |
| 7 | N | 1 | | | | | | | | | High. |
| | W.SW | 3 | | | S | 2 | N | 1 | | | Middle. |
| | S | 3 | | | SW | 2 | S | 2½ | S | 2½ | Lower. |
| 8 | | | | | | | | | | | High. |
| | W | 2 | | | | | | | | | Middle. |
| | S.SW | 3 | S | 3 | SW | 2 | S | 2 | S | 2 | Lower. |
| 9 | | | | | | | | | | | High. |
| | | | | | | | S | 3 | | | Middle. |
| | S | 3 | S | 3 | S | 3 | SE | 3 | S | 2 | Lower. |
| 10 | | | | | | | | | | | High. |
| | | | W | 2½ | | | S | 2 | S | 2 | Middle. |
| | S | 2 | S | 3 | S | 2 | S | 2 | E | 3 | Lower. |
| 11 | | | | | | | | | | | High. |
| | | | | | | | | | | | Middle. |
| | E.SE, fog | 1 | E.SE., fog | 1 | E | 3 | E | 3 | S | 1 | Lower. |
| | | | | | | | | | | | High. |
| 12 | | | | | | | | | | | Middle. |
| | S | 1 | S | 1 | Fog, N. w'd | 3 | E SE | 2½ | E.SE | 3 | Lower. |
| 13 | | | | | | | | | | | High. |
| | | | | | | | N. & SE. | 1 | | | Middle. |
| | | | Fog | | Fog, E | 2½ | SE | 2½ | | | Lower. |
| 14 | | | | | | | | | NW | 1 | High. |
| | SE | 2 | S | 2 | SE | 2 | SE | 2 | SE | 2 | Middle. |
| | E | 3 | E | 3 | SE | 3 | S | 2 | S | 3 | Lower. |
| | | | | | N.NW | 1 | | | | | |
| 15 | | | W | 2 | NW | 2½ | | | | | High. |
| | | | S | 2 | SE | 2½ | S | 2 | S | 2½ | Middle. |
| | S | 2 | E | 2½ | S.SE | 3 | S | 2 | S | 2½ | Lower. |
| 16 | | | | | | | | | | | High. |
| | | | | | S.SW | 2 | S | 2½ | | | Middle. |
| | S | 2 | S | 2½ | S | 3 | S | 3 | S | 2½ | Lower. |
| 17 | | | S | 2½ | | | | | | | High. |
| | | | W | 3 | W | 2½ | SW | 2 | | | Middle. |
| | S | 2 | SE | 2½ | S | 2½ | SE | 1 | SE | 3 | Lower. |
| 18 | | | | | | | NW | 1 | | | High. |
| | SE | 2 | | | SE | 2 | | | | | Middle. |
| | SE | 2 | SE | 2 | E.SE | 2½ | S. & E | 2½ | S | 1 | Lower. |
| 19 | | | | | W | | | | W | 2 | High. |
| | W | 2½ | N | 1 | W | | SW | 1 | | | Middle. |
| | W | 2½ | | | N | | NW | 3 | S | 2½ | Lower. |
| 20 | NW | 3 | | | | | | | | | High. |
| | | | W.NW | 2 | NW | 2½ | NW | 2½ | | | Middle. |
| | | | | | | | | | | | Lower. |
| 21 | | | | | N | 2 | W | 2 | | | High. |
| | | | SW | 1 | E | 1 | S | 2 | | | Middle. |
| | | | N | 1 | S | 2½ | E | 2½ | | | Lower. |
| 22 | | | | | | | | | | | High. |
| | S | 2 | S | 2 | S | 2½ | S | 2½ | S | 2 | Middle. |
| | | | | | | | | | SE | 3 | Lower. |

No. 4 —*Course of clouds.*

| Month. | E. | E.SE. | SE. | S SE. | S. | S.SW. | SW. | W.SW. | W. | W.NW. | NW. | N.NW. | N. | N.NE. | NE. | E.NE. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1856. | | | | | | | | | | | | | | | | | |
| November | 13 | ..... | 4 | 1 | 6 | ..... | 1 | ..... | 2 | ..... | 1 | ..... | 15 | ..... | 1 | ..... | |
| December | 21 | 6 | 11 | ..... | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | 6 | ..... | 4 | 2 | |
| 1857. | | | | | | | | | | | | | | | | | |
| January | 6 | 1 | 4 | ..... | 6 | ..... | ..... | ..... | 1 | ..... | 3 | 2 | 16 | ..... | 10 | 1 | |
| February | 11 | 2 | 8 | 1 | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 11 | ..... | 1 | ..... | |
| March | 14 | 6 | 11 | 5 | 12 | ..... | 1 | ..... | 4 | ..... | 1 | ..... | ..... | ..... | 1 | ..... | |
| April | 1 | ..... | 3 | ..... | 1 | ..... | ..... | 1 | 5 | ..... | ..... | 1 | 7 | 1 | 1 | ..... | High. |
| | 4 | 2 | 5 | 4 | 36 | ..... | 6 | ..... | 6 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | Lower and lowermost. |
| May | ..... | ..... | ..... | ..... | 1 | ..... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | High. |
| | 5 | 2 | 10 | 12 | 27 | ..... | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Lower. |
| | 11 | 3 | 3 | 2 | 3 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Lowermost. |
| Total | 86 | 22 | 59 | 25 | 101 | ..... | 11 | 2 | 19 | ..... | 7 | 3 | 55 | 1 | 18 | 3 | |
| | 293 | | | | | | | | | | | | | | | | |

| Month. | Number of days on which the sky was— | | | | | | No. of rainy days. |
|---|---|---|---|---|---|---|---|
| | Free from clouds. | | | Entirely overcast. | | | |
| | 7 A. M. | 2 P. M. | 9 P. M. | 7 A. M. | 2 P. M. | 9 P. M. | |
| 1856. | | | | | | | |
| June | 0 | 0 | 2 | 7 | 7 | 7 | 19 |
| July | 2 | 1 | 0 | 9 | 11 | 6 | 21 |
| August | 3 | 0 | 5 | 7 | 12 | 9 | 26 |
| September | 0 | 0 | 0 | 10 | 10 | 7 | 22 |
| October | 1 | 0 | 3 | 3 | 9 | 9 | 20 |
| November | 4 | 0 | 14 | 4 | 16 | 3 | 21 |
| December | 8 | 0 | 17 | 5 | 14 | 2 | 21 |
| 1857. | | | | | | | |
| January | 12 | 0 | 22 | 3 | 7 | 0 | 10 |
| February | 4 | 0 | 9 | 4 | 13 | 3 | 20 |
| March | 4 | 0 | 8 | 9 | 14 | 4 | 9 |
| April | 0 | 0 | 7 | 7 | 4 | 3 | 6 |
| May | 0 | 0 | 1 | 16 | 18 | 13 | 25 |
| Total | 38 | 1 | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |

## No. 5.

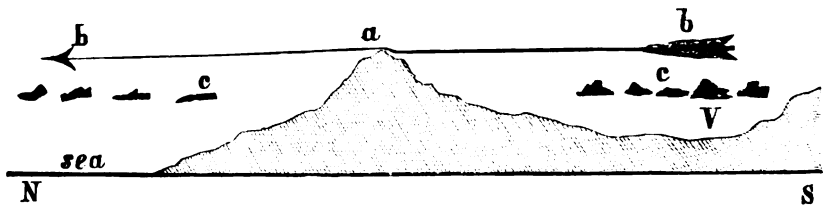
*Observations on the motion of strata of clouds of different heights at Colonia Tovar.*

| Date. | 7 A. M. | | 9 A. M. | | 12 M. | | 3 P. M. | | 6 P. M. | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Direction. | Force. | Direction. | Force. | Direction. | Force. | Direction. | Force. | Direction. | Force. | |
| 1857. | | | | | | | | | | | |
| pl. 3 | W | 1 | W.SW | ½ | | | | | W.SW | 1 | Cir. and very high clouds. |
| | | | | | N.NE | 2½ | N.NE | 2 | N.NE | 2 | Mid. stra. 7,500—9,000 h. |
| | | | Station | | E | 2 | SE | 3 | | | Low. stra. 7,000—7,500 h. |
| 4 | | | | | | | | | Station | | High. |
| | | | | | NW | 2 | | | SE | 2 | Middle. |
| | | | | | SE | 3 | | | SW | 3 | Lower. |
| 5 | | | | | W.SW | 2 | | | | | High. |
| | | | | | | | | | | | Middle. |
| | | | | | S | 3 | S | 3 | | | Lower. |
| 6 | | | W | 1½ | N | 1 | | | | | High. |
| | N.NW | 2 | | | S. & N | 2 | SW | 2 | | | Middle. |
| | S | 3 | N | 3 | S.SW | 3 | S | 3 | | | Lower. |
| 7 | N | 1 | | | | | | | | | High. |
| | W.SW | 3 | | | S | 2 | N | 1 | | | Middle. |
| | S | 3 | | | SW | 2 | S | 2½ | S | 2½ | Lower. |
| 8 | | | | | | | | | | | High. |
| | W | 2 | | | | | | | | | Middle. |
| | S.SW | 3 | S | 3 | SW | 2 | S | 2 | S | 2 | Lower. |
| 9 | | | | | | | | | | | High. |
| | | | | | | | S | 3 | | | Middle. |
| | S | 3 | S | 3 | S | 3 | SE | 3 | S | 2 | Lower. |
| 10 | | | | | | | | | | | High. |
| | | | W | 2½ | | | S | 2 | S | 2 | Middle. |
| | S | 2 | S | 3 | S | 2 | S | 2 | E | 3 | Lower. |
| 11 | | | | | | | | | | | High. |
| | | | | | | | | | | | Middle. |
| | E.SE, fog | 1 | E.SE., fog | 1 | E | 3 | E | 3 | S | 1 | Lower. |
| | | | | | | | | | | | High. |
| 12 | | | | | | | | | | | Middle. |
| | S | 1 | S | 1 | Fog, N. w'd | 3 | E SE | 2½ | E.SE | 3 | Lower. |
| 13 | | | | | | | | | | | High. |
| | | | | | | | N. & SE. | 1 | | | Middle. |
| | | | Fog | | Fog, E | 2½ | SE | 2½ | | | Lower. |
| 14 | | | | | | | | | NW | 1 | High. |
| | SE | 2 | S | 2 | SE | 2 | SE | 2 | SE | 2 | Middle. |
| | E | 3 | E | 3 | SE | 3 | S | 2 | S | 3 | Lower. |
| | | | | | N.NW | 1 | | | | | |
| 15 | | | W | 2 | NW | 2½ | | | | | High. |
| | | | S | 2 | SE | 2½ | S | 2 | S | 2½ | Middle. |
| | S | 2 | E | 2½ | S.SE | 3 | S | 2 | S | 2½ | Lower. |
| 16 | | | | | | | | | | | High. |
| | | | | | S.SW | 2 | S | 2½ | | | Middle. |
| | S | 2 | S | 2½ | S | 3 | S | 3 | S | 2½ | Lower. |
| 17 | | | S | 2½ | | | | | | | High. |
| | | | W | 3 | W | 2½ | SW | 2 | | | Middle. |
| | S | 2 | SE | 2½ | S | 2½ | SE | 1 | SE | 3 | Lower. |
| 18 | | | | | | | NW | 1 | | | High. |
| | SE | 2 | | | SE | 2 | | | | | Middle. |
| | SE | 2 | SE | 2 | E.SE | 2½ | S. & E | 2½ | S | 1 | Lower. |
| 19 | | | | | W | | | | W | 2 | High. |
| | W | 2½ | N | 1 | W | | SW | 1 | | | Middle. |
| | W | 2½ | | | N | | NW | 3 | S | 2½ | Lower. |
| 20 | NW | 3 | | | | | | | | | High. |
| | | | W.NW | 2 | NW | 2½ | NW | 2½ | | | Middle. |
| | | | | | | | | | | | Lower. |
| 21 | | | | | N | 2 | W | 2 | | | High. |
| | | | SW | 1 | E | 1 | S | 2 | | | Middle. |
| | | | N | 1 | S | 2½ | E | 2½ | | | Lower. |
| 22 | | | | | | | | | | | High. |
| | S | 2 | S | 2 | S | 2½ | S | 2½ | S | 2 | Middle. |
| | | | | | | | | | SE | 3 | Lower. |

table matter, of which I spoke in my last letter, got to be dry enough to take fire.

The dry season of the present year we recognize only in the months of March and April and a part of January. From inquiry, I learn that well defined dry seasons have also been rather rare previous to my stay in the colony.

Table No. 4 gives the course of the clouds for seven months. The most numerous direction is as usual from south and east and the points intermediate amounting to 293. As a striking feature may be noticed the increase in the number of currents from the south since January, when there are only six, while in April we find 37 and in May 31. This may well account for the fact, which captains of vessels trading between the United States and the coast of Venezuela have noticed so frequently, of meeting during the months of April and May with steady blowing southern breezes, and which I had an opportunity to notice myself on my last voyage to Laguayra. In some places east of the colony, on the back of the Cordilleras of the coast, I have experienced this steady current from the south as often as I had occasion to traverse this region on my way to Caracas, with the exception of only once. It amounts sometimes to a strong breeze. Other colonists, who frequent this road more than I do, have noticed this remarkable wind nearly at all times of the year.




Several times I had a most excellent opportunity for observing and tracing the course of this southern current to a great distance in the direction south and north. I was then standing on the very crest of the mountains of the coast, having a view towards the north upon the sea, and towards the south over a part of the fertile valleys of Aragua. Scattered masses of clouds showed plainly by their motion the direction of the current in a long line, whence it came and whither it went. The annexed figure may serve to give a somewhat clearer idea. It is to represent a vertical section of the territory from south to north, *a* the place of observation, V the valleys between the northern and southern ranges, *c c* clouds moving with the eastern trade-winds towards the west, the line *b d* the track of the high southern current, which had a velocity of about twelve miles per hour, and a somewhat sinking tendency, until it struck the northern range, where it was forced upwards for a short distance until it reached the crest, and then went on unobstructed on the other side of the mountains, in a horizontal line, apparently lowering but very little, leaving hereby the eastern trade-winds of the sea far below and undisturbed in their regular and steady course, which is nearly at right angles to that of

the former. The lower clouds of the valleys showed plainly a motion from east to west, as seen against the dark background of the southern mountains. The high southern current was not indicated by clouds in those places where it was vertically over the lowest parts of the valley; but when drawing nearer to the Cordilleras, on which I stood, the vapors which it contained condensed rapidly, and became visible as drifting, incoherent clouds sweeping by, and which could still be seen on the sea-side as long as they floated over the dense primeval forest, which extends here from the mountains' tops to the very margin of the sea.

Here I may also remark that the great amount of cloudiness, which in some respects may be regarded as a disadvantage to observation, offers, with regard to the currents of the atmosphere, great advantages, the condensed vapors indicating the various motions and directions of these currents, and I have had, therefore, opportunities to observe them in most of their various forms. Sometimes I have seen the air ascend and descend vertically with considerable velocity, at other times pushed up the inclined planes of mountain flanks on one side until reaching the crest, and then gliding or flowing down on the other side somewhat like a liquid, following in its course the most depressed localities and ravines in all their windings. Sometimes the eastern currents may be seen in their gradually ascending but nearly horizontal course to meet the higher southern current at right angles, and, without mixing, to be deflected by the latter in a horizontal semicircle, or downward or upward, as the case may be. I have also seen two opposite currents meet, when each endeavored to force its antagonist back with alternate success and failure, until one got the better over the other, and at last kept undisputed sway.

At certain seasons of the year we may see extensive sheets of cloudy masses press closely over the northern or the southern range of the colony valley, and gliding down the declivity for a short distance become invisible and disappear in crossing the cultivated part of the valley, but reappear again on drawing near the opposite ridge. Frequently I have seen immense masses of clouds leaning against the northern side of the crest of the mountains, and as if stuck to them, for whole days, and while the base was gently sliding upwards towards the south, the top of the cloud, which was towering above the mountains, was bent back and moving slowly in an opposite direction.

When standing on some high mountain, especially early in the morning, I have seen dazzling white coherent masses of clouds filling up far below me whole valleys, the surface of these clouds representing immense and level snow fields, from which, in a most lovely and striking contrast, the green summits of the smaller mountains protruded as so many islets, or higher and lesser promontories of a frozen arm of the ocean. The delusion is sometimes most complete, and cannot be viewed without feelings of pleasure and surprise. The elevation of the upper surface of these clouds was between 5,000 and 6,000 feet above the level of the sea.

A striking feature in table No. 4 may be found in the prevalence of northern currents from November till February, inclusive, while they are much rarer or entirely wanting in March, April, and May.

Among the number of days free from clouds we find that at 2 p. m. throughout all the twelve months there was only one single day where the sky was entirely clear, but at 9 p. m. we had a clear sky on eighty-eight days. In the month of September the sky was during all the ninety observations made in that month more or less clouded. At 2 p. m. the sky was *entirely* overcast on one hundred and thirty-five days. In May it was *entirely* overcast during forty-seven observations. The number of rainy days is two hundred and thirteen.

Table No. 5 contains observations on the motion of strata of clouds of different heights.

Observations on the motion of the highest clouds would be very important, but in this region we are unable to make a great number of such observations on account of the cloudy state of the sky, and we have to make the best of the few opportunities we may now and then get. As April is one of the most favorable months for this purpose, I have chosen this time, and have taken peculiar pains in collecting the facts contained in table No. 5. The greatest difficulty hereby exists in telling exactly which of the many different thin strata of clouds are the higher and which the lower ones. I was sometimes obliged to watch them for ten minutes right over head; but knowing that inaccurate observations are infinitely worse than none at all, I did not shun any inconvenience to arrive at the true motion of the different strata.

From this table we see that in the upper and highest regions the following winds were observed chiefly to occur: W.NW., W.SW., N.; in the middle regions, say from 7,000 to 9,000 feet above the sea, S.SE., W.SW., N.NW., N.NE.; and in the lower region, say from 7,000 down to 5,000 feet and still lower, S.SE., E., E.SE.

I may here remark that, from long continued observation on the motion of the clouds, I am inclined to believe that all the easterly winds of this region are gradually *ascending* in their course towards the west, while the southern as well as the western currents are gradually *descending* in their course.

Diagram No. 7 gives a view of the curve of mean monthly temperature for Colonia Tovar compared with the curves for New Orleans, St. Louis, Missouri, and Boothia Felix. I have chosen these three latter places because they are all North American, and lying nearly under one and the same degree of longitude, but in different latitudes; Boothia Felix in north latitude 70.2°.

Diagram No. 8 contains all the mean daily heights of the barometer from November 7, 1856, to April 30, 1857, and from May 9 to June 3. A similar diagram for June to October, 1856, I have sent already with one of my former letters. At that time I remarked that a kind of periodical rising and falling in periods from four to five days was observable, but I did not then expect that this rule would hold out for the remainder of the year. But after I had finished diagram No. 8, merely to see what kind of curve these months would present to the eye, I was struck with its appearance in shape, and induced to count the days from vertex to vertex, which, commencing with November 11, gave me the following numbers: 6, 5, 2, 5, 6, 4, 4, 3, 6, 4, 6, 3

5, 3, 4, 5, 3, 7, 3, 5, 4, 5, 3, 6, 6, 4, 4, 2, 4, 6, 5, 5, 3, 7, 4, 6, 4 = 167, of which the mean is 4.5 days, as the mean period occurring between every two successive heights or vertices.

The same process applied to the former diagram of the months of June to October, 1856, gives me the following numbers: 5, 4, 5, 3, 5, 3, 4, 4, 4, 5, 6, 5, 4, 6, 3, 4, 3, 4, 3, 6, 4, 3, 4, 6, 10, (= 2 + 5,) 5, 5, 5 = 128, of which the mean number is 4.4 days. For May, 1857, commencing with the 14th, the numbers are 3, 5, 5, 5, 3.

No matter whether the barometer had a perfect vacuum or not, the features of this remarkable phenomenon are the same. The two series of the above numbers, and the coincidence of their mean value, prove beyond a doubt that they are not the result of mere accident; but that this periodical fluctuation in the pressure of the atmosphere is subject to a certain law, of which I am ignorant.

Diagram No. 9 exhibits two curves of the mean temperature for Colonia Tovar for twelve months. The upper curve is the result of noting down the mean temperature for every *third part* of the month, and presents quite a different appearance compared with the lower curve, in which are noted down the mean temperatures of the whole months only. The latter part of April and the middle of September show the highest, and the middle of January the lowest temperature. July has usually a lower temperature than the three months on either side of it. The mean temperatures of the four meteorological seasons present the curious fact that three of them, spring, summer, and autumn, have exactly the same temperature, viz: 58.9, even to a fraction. The mean temperature of the year is 58.2; difference between the coldest and warmest month, 5.3.

The temperature of the primeval forest, about two hundred yards distant from my dwelling, was, on the 25th of April, at 1*h*. 30*m*. p. m., 61°, at the margin 64°, when at my house the thermometer was 65°. In a shady ravine I stuck the thermometer four inches deep into the spongy brown vegetable mould at different times of the day, and found the temperature always 59°, pretty near the mean temperature of the year. 58° or 59° may be considered to be the *constant* temperature of this region about twelve inches below the surface of the ground in shady places.

I have often observed that, whenever the sun breaks through the clouds and has been shining for a couple of hours, the thermometer fluctuates frequently very suddenly from one to four degrees, according as it is touched by a warmer or colder current of air proceeding from the differently heated localities of the soil; but when the sky is entirely overcast such changes never take place.

It seems somewhat remakable that, at Colonia Tovar, no heavy thunder-storms occur. Thunder and lightning are seldom strong enough to deserve to be mentioned. Trusting to past experience with regard to the absence of tempests, hurricanes, and whirlwinds, I have covered the roof of my house with very thin and light shingles, not nailed down, as is done in the States, but merely hung loosely upon laths without any weather-boarding at all. And yet, for two

years, they have remained in this position undisturbed by winds and weather.

The stars are here seen to scintillate on every clear evening the same as they do in higher latitudes, with the exception of a small area in the zenith of about 45 degrees, where they have their steady planetary light mentioned by Humboldt, and to be observed in lower regions. The zodiacal light I have never been able to see in the colony, although I have looked for it every clear evening.

Besides the already enumerated tables and diagrams, I have also inclosed four sheets of copies of sculptured rocks, or, as they are called in this country, "piedras pintadas," (painted stones.)

These rocks, which I have found in different regions, in low hot valleys as well as on high cold mountains, seem to be the work of one and the same race of men. The original figures are on a large scale. A few well-preserved spots, sheltered by a layer of sandy soil against the destructive influence of the atmosphere, show that the outlines of these figures are grooves, engraved or chiseled very smoothly and regularly to the depth of at least an inch in the hardest rock, and evinces a skill which would do credit to any of the civilized inhabitants now living in this country, even when aided by tools of steel There is no mere scratching about them; they have been sculptured. They show clearly that they were worked to *last*, and to outlive full many a change in the history of nations. The delineations are in all of them, whether from the sultry and insalubrious coast of Puerto Cabello, or from the cold mountain regions of the colony, of the same kind of workmanship, consisting of grooves about an inch wide and an inch deep.

Time has worked sadly at most of these stones, and on some of them I found only traces of figures.

All these rocks I found by accident in my botanical rambles, in places where I never would have ventured to penetrate, and where I was led by necessity when strayed and trying to find my way back.

Whatever may be said of these figures, patiently worked into the rock, they were not done without a certain design. Whether they were intended to convey any peculiar meaning, or none at all, the Indians have hereby bequeathed to us the means of comparing them with similar monuments in other distant regions. So much is certain, they were worked with the intention to remain there for a *long* period of time, and to be looked at by posterity. These figures consist in images of objects, with which their makers were surrounded and acquainted, as, for instance, alligators or large lizards, snakes, tigers, canoes, sun, moon, human heads, &c., but show no signs of implements of civilization. Therefore these figures may be supposed to date anterior to the conquest of the country by the Spaniards. No record of the existence of these rocks, I suppose, has hitherto ever been made, for this region has been discovered but very lately, and none of the natives living in the neighboring valleys have known anything about them. In this case I may have been the first and only stranger who ever beheld their yet lasting works, of which they took so much pains to make a show in after years.

But how fallacious are often the most unpretending expectations of ıations as well as of individuals. These Indians, as a tribe or nation, nay have removed, or become extinct, or been driven away; for cer-ain it is that they are gone, and have vanished from this region. Month after month and year after year (until amounting to centuries) vent silently on over the only yet remaining witnesses of their existence. The luminaries of day and night had their glittering rays alternately eflected from the inclined and even surfaces of these rocks; the rain an down innumerable times as from a roof and washed the figures lean. Wind and water and oxygen and heat worked slowly but ffectually at the destruction of the figure-furrowed surface, and suc-eeded but too well. But no one came to wonder at the skill and atience of their makers. Fifty or a hundred years more would have lone their destructive work completely, and these figures would have anished and gone, probably without having been noticed even by a ingle individual.

Occupied with such reflections as these, when seated near the sim-le memorials just spoken of, I feel myself richly remunerated for all ny fatigue and the trouble to snatch them from oblivion.

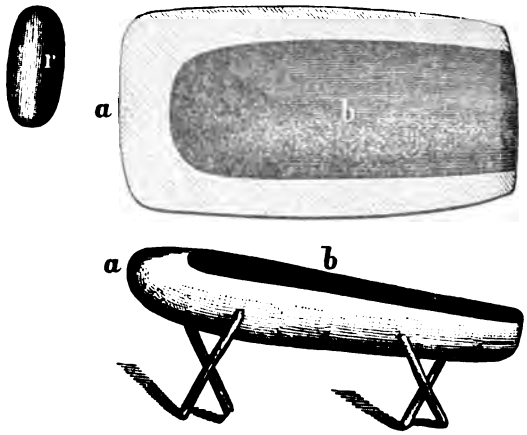
That these sculptured rocks were intended to be seen and noticed is roved by the fact that they are never found in the primeval forest, ut most generally in some prominent part of a savannah, bordering n the forest, although now overgrown with brushwood and reeds. ome of the figures were found in a place partly overgrown with small rees, or rather shrubs of a stunted growth, mostly of small specimens f clusia, which fact may prove how slowly a dry savannah, even when ndisturbed by fire, is rechanged again into a forest; while it takes ut a few years to change, by the aid of fire, a forest into a savannah.

These localities show, also, clearly enough to a person acquainted rith the mode of agriculture in the mountainous districts that the ndians have subsisted on agriculture and not on the chase, for by the atter not even a dozen individuals could keep themselves alive for any ength of time, much less a whole tribe.

The barometer which I carried to the region of the sculptured rocks ssigns to them a height of about 5,900 feet above the ocean. When e consider the wet, cold, disagreeable, and foggy weather which revails during the greater part of the year in this region, where the reoles, in coming up from the warmer valleys, sometimes shiver with old, where the banana and other cultivated tropical plants seldom ear fruit, and where Indian corn can only be raised with difficulty r not at all, we may perhaps be inclined to think that the Indians hose this cold region from predilection; and in this case might proba-ly have descended from the same stock that peopled and preferred he high regions of the Peruvian Andes. But when we afterwards nd similar rocks near the hot and sultry coast of Puerto Cabello, and n other low valleys, the above inferences would have to undergo con-iderable modification.

A corn or maize-grinder is in general use amongst the creoles of enezuela, which, considering its very rude and simple construction,

seems not to be of European invention. It consists merely of a flat stone *a* 1½ foot long, 14 inches wide, and 3 inches thick, somewhat convex on the lower and concave on the upper surface; the concavity *b* is flat, and 7 inches wide. The runner *r*, with which the corn is crushed, is a stone about 5 inches long, 3 inches wide, and of an oval form, so as to fit the concavity *b*. The person crushing the corn stands near the upper end of the stone, and holds the runner with both hands, and in crushing the previously soaked and somewhat pounded corn brings to bear nearly the whole weight of the upper part of the body upon the runner. The ground pulpy mass is shoved off at the lower end of the stone into some vessel. If the pulp is not fine enough it is crushed over again. This pulp, washed to remove the skins of the corn, and then baked upon hot stoves, constitutes the bread of all the creoles not living in town. The whole work of pounding and crushing is performed by females, and is a most tedious drudgery. It is really astonishing that the people here have not yet made use of the iron corn-grinders used so universally in the backwoods of the United States, although they can be bought at Caracas. The above rude corn-grinder, or rather corn-crusher, is used also to crush roasted coffee, cocoa, and salt, and has been even adopted by some German families. I have been explicit on this subject, because in Emory's "Notes of a Military Reconnaissance," page 133, I find made mention of a similar corn-grinder used among the Pimos; but whether it is of the same shape as these here I have no means to learn.




Barometrical measurement shows that the river Tuy, seven or eight miles to the S SE. of Colonia Tovar, is only about 3,100 feet above the level of the sea, while at Colonia Tovar it is at least 6,000 feet. This river has therefore a descent of nearly 3,000 feet within eight miles, or, on an average, a fall of 375 feet per mile. Such is the territory of the colony.

On the 28th of May I carried the barometer to the "Picacho," one of the highest peaks in the neighborhood of the colony, and found the height of the mercury at 9¼ a. m. 22,736, thermometer 69°, from which I conclude that this mountain may be only 500 or 600 feet inferior in height to the "Silla" of Caracas, the highest peak of the coast range of Venezuela.

In travelling from Victoria towards Valencia we find, about three

west of Tarmero, right in the middle of the road, the famous
ıang," an enormous tree, so well described by Alexander V.
ɔoldt. Its head, formed by enormous horizontal branches, is the
remarkable part of this giant of trees. A section of its head
l present a shape as shown in the marginal figure.

ıeasured the head in its greatest diame-
om E.SE. to W.NW. most carefully,
ɔund it to be 206 feet 11 inches, English.
ty-seven years ago it was found by
ɔoldt to measure in its greatest diameter 192 feet, French mea-
which would be equal to 204.48 feet, English. Hence it follows
this tree has within the last 57 years increased the horizontal
ɜter of its head only by 2 feet 5 inches, English. The branches
aded with a wonderful mass of epiphytes and parasites; and it
surprising that branches of nearly 100 feet in length, standing
ɔntally out from the trunk, can support for centuries, besides
own astonishing weight, such an extra load of heavy plants as
eliaceæ, Orchideæ, Cacteæ, Loranthaceæ, Piperaceæ, &c.
ıs extraordinary tree is but thinly covered with leaves; it looks
it lacks vigor to issue new slender branchlets, for its ultimate
hlets are old, short, thick, and of stunted growth.
ting out from Petaquire, (a place nearly as high as the colony,)
ɜ 8th of February, in an excursion towards the sea coast, my at-
n was directed to some *cow-trees*. The space over which they
distributed was but very limited in the direction north and
, but extended more towards east and west, and was about
feet above the sea. Their external appearance, the shape of the
and leaves, agreed exactly with the description given by Alex-
V. Humboldt. Most of them were trees of 1 to 1½ foot in
ɜter, but very tall. I also found some younger ones of 5 inches
ɜter. In seven or eight of these trees of different age and di-
ons, I made incisions, to see the milk flow. Although it was
the same season of the year when Mr. A. V. Humboldt saw
ɔw-tree between Valencia and Puerto Cabello, I never could elicit
them much more than 1 or 2 drops in a second of time. There
ıot much difference in the flow of milk between the larger and
naller trees; and if ever I was disappointed in my expectations I
nly was on this occasion as to the quantity of milk. The milk
ı agreeable, mild, rather rich taste, and becomes somewhat sticky
ɜn the fingers. People who live not far off, and have tried these
rees in different years, do not praise much their milk-yielding
ties. The cow-trees grow in the midst of shady, humid forests,
elevation of about 3,000 or 4,000 feet, along the sea-fronting
ities of the high mountain range, stretching from east to west
the northern coast of Venezuela. I have neither seen the fruit
ıe flowers of this tree; but in comparing its leaves with leaves of
ɜ in my herbarium, I find the closest resemblance in shape,
ıure and venation with some species of fig-trees. The wood is
and of considerable hardness.
ɔassed the night in the midst of an immense forest, on a thin
of dried grass, in a small, uninhabited, open shed, (a plantain

leaf thatched roof, resting upon six isolated posts,) near to which a tiger was said to have his range. Towards evening torrents of rain poured down; but the night was still and undisturbed, except by the rushing mountain-stream at some distance off, which appeared to the watchful ear like the hollow rustling of a forest in a gale of wind. One solitary bird near by made the spot still more melancholy by its mournful notes, which it sent forth from time to time throughout the night, unanswered by anything living.

These damp and shady primeval forests, especially when fronting the sea, are also to be noted for the great amount of ferns, with regard to species as well as to individuals. This beautiful class of plants, of which I have already collected 489 species within a comparatively small part of the country, loves moisture, shade, and *stagnant* air, and rarely ever succeeds in a climate or region which lacks these three great necessary conditions. With regard to number of individuals, the different heights show no marked effect. I found them in masses equally dense at 1,500 and 6,500 feet elevation; and I have descended and ascended the flanks of the coast-chain in five different regions.

The only difference we see is the change of species in different heights, and even here we find many species to extend over a great area of different elevation; but most species are rather of a local habit.

We can, therefore, from the amount of ferns which occurs in any given place, not very well deduce the mean temperature of that place, as is sometimes done in geology, in conjectures about the temperature of the earth's surface at the time of deposition of the coal fields, unless we know what temperature belongs to the luxuriant growth of that very species which we wish to draw conclusions from. The yearly mean temperature of the fern region may vary from 56° to 80° F.

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COLONIA TOVAR, VENEZUELA, *January* 10, 1858.

DEAR SIR: Under date of June 11, 1857, I sent you a letter, together with some meteorological registers and a number of tables and diagrams, which you probably will have received in due time. Inclosed I send you now—

No. 1. Registers of meteorological observations for seven months, viz: from June to December, 1857, inclusive.

No. 2. A table showing by the length of horizontal lines at what time of the day it rained at Colonia Tovar for each day from June to December, 1857, inclusive.

No. 3. A table containing a recapitulation of the occurrence of rain expressed in number of hours, for all the months from July, 1856, to December, 1857, from 6 a. m. to 10 p. m. This table also shows by the length of straight lines the comparative value for each *month*, as regards the number of hours of rain; and in another diagram the mean rain value for each *hour* from 6 a. m. to 10 p. m.

It may not be uninteresting here to see what a symmetrical figure the curve *a b c* represents; how it rises gradually from 6 a. m. to the

our between 2 and 3 p. m., and then sinks to 10 p. m. nearly as radually as it rose.

No. 4. A table giving the course of the clouds of the higher, midle, and lower strata for the months of June to December, 1857. 'he motion of the clouds from the E., E.SE., SE., S.SE., and S. is y far the most prevailing, amounting to 415, while the motions from ll the other eleven points amount only to 133. November and Deember show, as usually, a preponderance over the eight preceding ıonths with regard to motion of the clouds from the northern reions. The motions from the west, with only one exception, took lace in the highest regions of the atmosphere. This puts me in ıind of the fact that, while at Santa Fé, New Mexico, the steady ourse of the higher clouds from the west had frequently attracted ıy attention.

No. 5 gives a view of the fluctuation of the mean daily heights of he barometer for seven months. My remarks in a former letter about he falling and rising of the mean daily height of the barometer, which from one maximum to another requires, on an average, 4½ days, till hold good, as will be seen by the following series of numbers, which are the number of days counted from one maximum height to he next following one.

Beginning with my earliest barometrical observations, counting rom the 14th of June, 1856, and ending with the 30th of October, 856, the day on which the barometer got out of order, we have: 5, , 5, 3, 5, 3, 4, 4, 4, 5, 6, 5, 4, 6, 3, 4, 3, 4, 3, 6, 4, 3, 4, 6, 10, 5, , 5 = 128 days, of which the mean is 4.57 days.

Beginning again, when the barometer was put into use, with the 2th of November, 1856, and ending with the 30th of April, 1857, he day on which the barometer was taken apart to be mended, we get: 6, 5, 2, 5, 6, 4, 4, 3, 6, 4, 6, 3, 5, 3, 4, 5, 3, 7, 3, 5, 4, 5, 3, 6, , 4, 4, 2, 4, 6, 5, 5, 3, 7, 4, 6, 4, 2 = 169 days, of which the mean s 4.45 days.

Beginning again, when the barometer was in good order, with the 3th of May, 1857, and ending with the 31st of December, 1857, we get: 2, 3, 5, 5, 5, 3, 4, 5, 4, 4, 3, 3, 3, 2, 4, 8, 4, 4, 5, 3, 4, 7, 2, 5, , 4, 5, 6, 5, 4, 5, 2, 4, 4, 2, 5, 3, 7, 7, 5, 4, 4, 5, 6, 4, 5, 10, 8, 6, , 3 = 230 days, of which the mean is 4.51 days.

The mean of all these three series is 4.51 days.

No. 6 contains the half-hourly observations on the daily periodical variations of the barometer for 157 days, which, together with those nade from the 10th of May to the 10th of June, amount to 186 days, ncluding more than 2,000 half-hourly observations of the barometer. During these seven months I was, if I may use the expression, "living under the clock;" for I had to keep a continual lookout for the ırrival of the moment when one half hour after another would be up.

How often was I interrupted in my out-door manual labors in order o attend to these observations! And but the desire to help carry a ew useful materials towards the building ground of the great structure of meteorology, which no doubt one day will be reared in all its perfection, could keep me at work with patience unwearied. I should ıave continued these half-hourly observations still longer, but my

other engagements multiplied so much that I found it utterly impossible to do so. The clock I used is a first rate time-piece, and was compared, from time to time, with the meridian line laid down by observation of the north star.

No. 7 contains the *mean* barometrical heights of all the half-hourly observations made in 1857, recapitulated chiefly from table No 6, to which are added the monthly means of the barometer at 7 a. m., 2 p. m., and 9 p. m. These latter means are not the means of the *whole* months, but of those days only on which half-hourly observations have been made.

No. 8 exhibits the curves of mean height of the barometer in its course from 7 a. m. to 9 p. m., laid down according to the numbers in table No. 7. We find these curves to be much more regular, and more gradually and smoothly rounded off in proportion to the number of days, of which they are the mean result. So is, for instance, the curve *c*, resulting from the mean of eight months, more smoothly rounded than the curve of the month of August or that of May; and these again more smoothly rounded than the curves resulting from single days, which I have sent in my previous communications to you, and which are more or less angular.

The curve *c* in diagram No. 8 may therefore serve to illustrate the true and normal course of the periodical rise and fall of the barometer from 7 a. m. to 9 p. m. Its rise and fall from 9½ to 11 a. m., and from 4 to 5 p. m., are very inconsiderable; but from 1 to 2½ p. m., and from 7 to 9 a. m., far more rapid. There exists also a difference in the shape of the curve of the month of August compared with that of the month of May.

No. 9 contains the *mean* amplitudes of the barometer, calculated from table No. 6, for periods from six to six successive days; also, the mean amplitudes for periods from 12 to 12 days, and likewise those for the different months. All these mean amplitudes are laid down in diagram No. 10, in their proper position, according to their numerical value.

No. 10. The monthly means in the first curve exhibit a pretty regularly rounded curve. The second curve, that is, the curve of the twelve daily means, is somewhat more irregular. The third, or six daily curve, is still more irregular, exhibiting many projecting corners. The fourth and lowermost, which can no longer be called a curve, and of which, to save time, I have given only a small portion, exhibits in a striking manner the great fluctuation of the daily amplitudes.

At first view there seems to be not the least tendency in them to follow a certain law with regard to their mean value. This law, however, becomes apparent, when we look at the next curve above, and still more so in the two uppermost curves. The third curve shows, also, that the nature of the curve of mean amplitudes is not the same in every year; in 1857, for instance, it is much higher from October to December than it was in 1856. All this indicates plainly enough that the daily amplitudes of the barometer are subject to great disturbances by some cause or other.

Great as the irregularities caused by such disturbances are in the

ıove curve, they do not invalidate the view I advanced in a former tter about the nature of this curve, as it ought to be in its normal ılue. In their main features both coincide, if we make due allowıce for the short period during which these observations have been ntinued. The curve in diagram No. 10 having its first maximum ɜar the 18th of May, its minimum near the 8th of July, and its cond maximum near the 27th of October, and if we were to draw a ean line between the heights of 1856 and 1857, the second maximum ɔuld be near the 3d instead of the 27th of October.

No. 11. In order to compare the course of the morning temperature Colonia Tovar with that of some place of the southern part of the nited States, I have in diagram No. 11 laid down in dotted line the urse of the temperature at 7 a. m. for the different days of March, 352, as observed by me at Memphis, Tennessee, with the same therometer with which I made my first observations at Colonia Tovar. he other line is the course of temperature at 7 a. m. for the different ıys of March, 1857, at Colonia Tovar.

Besides the regular observations specified above, I have made from me to time, just as occasion offered, memoranda on many other meorological subjects which came under my observation. These memonda were made either at the time of observation or immediately ter. They are rather numerous, and for want of time I am unable present to arrange them properly, or to make a selection from nong them.

I may, however, afford so much time as to give the following: July 27. In preparing for a journey to La Victoria, I rose early in e morning. At 4½ a. m. there was a dense fog. Intending to step ıt, and opening the kitchen door which leads into the open air, I w the sprightly burning kitchen fire reflected from the fog as from white, smooth, and solid wall; and, besides this, a halo of about ɾenty feet diameter, as plain and well defined as I ever saw around e moon. This halo, with the reflected fire in its centre, appeared be close before me in a vertical plain, and it changed its position henever I changed mine, either to the right or to the left.

At a first superficial glance upon the map it may seem as if the ırthern coast of Venezuela, on account of its great distance, can have ıthing to do with the climate of the United States, or that the meorology of the two countries can have no feature common to both; ıt observation proves it to be otherwise. And if we take a more mprehensive view of this vast region, we see that the Mexican gulf, gether with the Caribbean sea, is nothing more than a great inland a basin with numerous and spacious entrances to the northeast and st. Five States of the Union forming its northern shore; Venezuela, ew Grenada, and Central America, its opposite or southern shore. ere I may also remark about the Venezuelan mountain range of the ast, that its northern declivity towards the sea is generally very eep, and in many places near its crest bearing marks of immense asses of its body having sunk on that side far below its original vel, while on the other or southern side, no such marks are visible.

If we want to study in Venezuela the mutual influence of atmosıeric currents of these two opposite shores, viz: The southern coast

of the United states, and the northern of Venezuela, we must not try to do it on that low and extremely narrow strip of land, which, bordering the sea, stretches along the foot of the mountain chain running east and west, parallel with the seashore. This low and narrow strip of land has a climate of its own widely different from that of the United States. But when we take our abode on or near the top of the mountain ridge where we are above the steady eastern trade winds, and find ourselves in quite a different set of atmospheric currents, and if we then pay particular attention to the more violent northerly winds, which now and then blow in this region, and to the great southerly current, which lowers gradually in its course, reaches the surface of the sea somewhere between latitude 16° and 26° north, and generally blows steady during a great part of the summer and fall of the year up the Mississippi valley, even beyond latitude 39° north;* we then will recognize in the moisture-laden southeastern, as well as in the dry and chilling northwestern, by their very peculiarities, their namesakes of the United States.

It is but five or six times a year that I am fortunate enough to get hold of a few newspapers in these mountain solitudes, and it is seldom that they contain anything regarding the weather of the United States. However, I have read, only a few days ago, in a New York paper of August 22, 1857, the following:

"A private letter from New Orleans states that up to the 18th instant, it had rained there every day for thirty-eight days consecutively, and was still raining."

Now, by referring to my register of meteorology I find a singular coincidence between the occurrence of rain at New Orleans and Colonia Tovar. The inclosed table No. 2 exhibits this more strikingly, for we see here at once, that of all the seven months there is no other equally long period that can compare with the period from July 18, to August 20, with regard to the number of rainy hours.

The following sentence from the Weekly Herald of September 5, 1857:

"From New Mexico. The season has been unusually dry and cold, and the crops look very badly. So little rain has fallen that the little stream near Santa Fé is dried up," shows that the rain-spending southeast current of the atmosphere, which soaked in the month of August the soils of Colonia Tovar and New Orleans, never was felt at Santa Fé, New Mexico; and that there is a closer correspondence between the aëreal strata of the coast of Venezuela and the lower ones of Louisiana, than between those of Louisiana and those of Santa Fé, although the distance in a straight line between the two former places is more than double the distance between New Orleans and Santa Fé.

Again, we find in the Weekly Herald of January 17, 1857:

"A terrific hurricane swept over the city and harbor of Vera Cruz on the 20th of December," and "a heavy northerly gale had prevailed for several days previous to the 25th of December (at Havana.")

My meteorologicul register of Colonia Tovar shows, on the 17th of

* While living at St. Louis, Missouri, I had a good opportunity to notice, during several years, in July, August, and September, a steady southerly breeze almost day after day. In some years, however, this wind blows less regular than in other years.

December, 1856, at 7 a. m., north wind, 4.; on the 19th, at 7 a. m., clouds from the north, 4. ; on the 20th, at 7 a. m., clouds from the north, 3. ; at 9 p. m., clouds from the north, 4. Number 4, as an indication of force attached to the winds or the clouds is extremely rare in the register for Colonia Tovar, and therefore denotes something extraordinary. The mean barometer height was remarkably low on the 19th, 20th, and 23d of December, vid: diagram of mean barometer height for 1856.

I could, no doubt, cite many more instances of this kind if I had the means to know what is going on in other parts of the world.

To make observations in this country about the higher strata of the atmosphere and their motions, no place, I should think, would be more adapted than the mountains of Merida, which are said to reach the line of perpetual snow. There we have a gigantic range of snow-capped mountains stretching from southwest to northeast. Its base is washed on one side by the warm waters of the gulf of Maracaybo, that great arm of the sea, which runs far inland, and expands in a vast basin near the mountains. On the other side lie, in near approach, those immense, level, grassy plains, the Llanos of Venezuela, which are but slightly elevated above the level of the sea, and entirely bare of forest.

When in the dry season the sun, unobstructed by clouds, acts upon the extensive sheet of the already very warm water of the gulf, with all the power of its nearly vertical rays, the quantity of vapor carried into the air by evaporation must be immense, while at the same time, on the opposite side of the mountains, the rarified strata of the atmosphere vibrate over the dry and burning hot surface of the llanos as over a heated furnace.

The phenomena which the different strata of air under such circumstances must exhibit would, I think, form a worthy and highly interesting subject of study for the meteorologist, and tend to advance the cause of his science. Happy he who has the means and the mind to do so!

In connection with the foregoing, I will mention only one phenomenon, near the lake of Valencia, which may show some of the effects of evaporation with regard to its disturbance of the atmosphere.

As often as I have visited Valencia in the dry season I have observed a violent northerly wind, amounting sometimes to a very stiff breeze, blowing there late in the afternoon till 10 or 11 o'clock at night. I found this same wind also in other parts of the valley of Aragua near the lake of Valencia, as, for instance, in Cagua and San José.

By inquiry I learned that this is a regular wind, commencing and ending with the dry season, returning every year as regularly as the season itself; that it rises every afternoon, continues till late at night, and is very annoying to the inhabitants by the dust it raises.

By referring to Humboldt's Travels I find the following sentence, where he speaks about the site of the town of Valencia: "But there is an opening on the meridian of Nueva Valencia, which leads towards the coast, and by which a cooling sea breeze penetrates every evening

*Register of meteorological observations for Colonia Tovar, Venezuela, from June, 1857, to December, 1857, inclusive, by A. Fendler.*

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Well defined winds. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direct'n. | Force. | Direct'n. | Force. | Direct'n. | Force. |
| 1857. June 1 | 3.50 p. m.. | 4.10 p. m.. | 3 | E..... | 2 | ..... | 7 | S.SE.... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E. ..... | 2 | | | | | | | | | | | |
| 2 | ..... | ..... | 9 | S.SE..... | 2½ | ..... | 5 | S.SE.... | 2½ | ..... | 7 | SE..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 3 | 6.5 p. m... | 6.10 p. m.. | 6 | S.SW... | 1 | High .. | 5 | SE..... | 2 | ..... | 6 | S. ..... | 1 | ..... | ..... | ..... | ..... | ..... | S..... | 2 |
| | | | | S. ..... | 1 | Low. | | | | | | | | | | | | | | |
| 4 | 8.40 a. m.. | 9.10 a. m.. | 8 | E. ..... | 1 | ..... | 6 | SE..... | 2½ | ..... | 6 | E..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 9.30 a. m.. | 9.40 a. m.. | | | | | | | | | | | | | | | | | | |
| | 3.55 p. m.. | 4.20 p. m. | | | | | | | | | | | | | | | | | | |
| | 4.40 p. m.. | 6.15 p. m.. | | | | | | | | | | | | | | | | | | |
| 5 | 10.55 a. m. | 11.30 a. m. | 7 | E.SE... | 2½ | ..... | 7 | S..... | 2 | ..... | 10 | SE..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 2.45 p. m.. | 2.55 p. m.. | | | | | | E. ..... | 2 | | | | | | | | | | | |
| | 4.40 p m.. | 5.15 p. m.. | | | | | | | | | | | | | | | | | | |
| 6 | 5.50 a. m.. | 6.30 a. m. | 10 | ..... | ..... | Fog. .. | 10 | N..... | 3 | Fog..... | 9 | E.SE.... | 3 | ..... | N..... descending. | 4 | N..... | 3½ | ..... | ..... |
| | 7.40 a. m.. | 5.10 p. m.. | | | | | | | | | | | | | | | | | | |
| 7 | ..... | ..... | 10 | SE..... | 2½ | ..... | 8 | S.SE.... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | N..... in gusts. | 3 | ..... | ..... |
| 8 | ..... | ..... | 1 | SE..... | 2½ | ..... | 6 | S..... | 2½ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| | | | | | | | | NE.. ... | 2 | | | | | | | | | | | |
| 9 | ..... | ..... | 1 | S.SE.... | 2 | ..... | 3 | E.SE.... | 2 | ..... | 8 | E.SE.... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | 4.55 p. m . | 5.30 p. m.. | 3 | E.SE.... | 2½ | ..... | 7 | .SE.... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E. ..... | 2½ | | | | | | | | | | | |
| 11 | 10.45 a. m. | 11.15 a. m. | 4 | ..... | ..... | ..... | 10 | NE..... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S..... | 2 |
| | 6.40 p. m.. | 8.10 p. m.. | ..... | E ..... | 2½ | Low .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | 6.25 a. m.. | 7.30 a. m.. | 10 | ..... | ..... | ..... | 10 | SE..... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 10.45 a. m. | 11.10 a. m. | ..... | E. ..... | 2½ | Low .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 4.5 p. m... | 5.15 p. m.. | | | | | | | | | | | | | | | | | | |
| 13 | At night... | 6.30 a. m.. | 10 | E..... | 2 | ..... | 10 | E.SE.... | 2½ | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 11.15 a. m. | 12.10 p. m. | | | | | | | | | | | | | | | | | | |
| | 1 p. m..... | 1.40 p. m.. | | | | | | | | | | | | | | | | | | |
| 14 | ..... | ..... | 3 | S. ..... | 2 | ..... | 7 | E. ..... | 2½ | Low..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 15 | ..... | ..... | 10 | E.NE.... | 2 | ..... | 5 | S. .... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.... | 1 |
| | | | | | | | | E. ..... | 2½ | | | | | | | | | | | |
| 16 | ..... | ..... | 1 | W ..... | 2 | High .. | 3 | S. & SE. | 2½ | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 17 | ..... | ..... | 10 | ..... | ..... | ..... | 5 | SE..... | 2½ | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18 | ..... | ..... | 10 | S ..... | 2½ | ..... | 7 | SE..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | ..... | ..... | 10 | SE ..... | 2 | ..... | 10 | SE..... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |

blows as long as the temperature of the air falls: that is, till 10 or 11 o'clock at night. It is easy to imagine what a hurricane would blow if the cooling and condensing of the vapors were to be very sudden. What interesting barometrical and other observations could be made in the neighborhood of this lake!

Very frequently at night or evening, throughout the rainy season, we may observe, at Colonia Tovar, favored by the absence of daylight, flashes of lightning unaccompanied by any audible noise of thunder. This noiseless discharge of electricity shows itself also frequently in the daytime; but of all the many discharges of lightning during a three and a half years' residence I have heard only once or twice thunder loud enough to be compared with those of the United States.

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. June 1 | 23.994 | 23.979 | 24.000 | 58 | 63 | 59 | 60 | 68 | 57 | 61.7 | The same as thermometer in open air. | | | 58 | 62½ | 55 | |
| 2 | .976 | .958 | 23.976 | 58 | 62 | 60 | 58 | 64 | 58 | 60.0 | | | | 56½ | 60 | 57 | |
| 3 | .960 | .974 | .992 | 57 | 63 | 59 | 57 | 65 | 57 | 59.7 | | | | 52 | 59 | 54½ | |
| 4 | 24.004 | .988 | .996 | 58 | 64 | 59 | 57 | 64 | 57 | 59.3 | | | | 55 | 59 | 55 | |
| 5 | 23.998 | .972 | .984 | 59 | 64 | 59 | 59 | 65 | 57 | 60.3 | | | | 57 | 61 | 57 | Thunder at 5¾ p. m. |
| 6 | .978 | .954 | .980 | 57 | 58 | 55 | 55½ | 57 | 55 | 55.8 | | | | 55 | 57 | 53½ | |
| 7 | .976 | .960 | .966 | 55 | 61 | 57 | 54 | 60 | 55 | 56.3 | | | | 54 | 56 | 52 | |
| 8 | .982 | .985 | .982 | 55 | 63 | 57 | 55 | 62 | 55 | 57.3 | | | | 52 | 56 | 53½ | |
| 9 | .960 | .950 | .970 | 56 | 62 | 59 | 58 | 64 | 56 | 59.3 | | | | 55 | 56 | 55 | |
| 10 | .948 | .946 | .936 | 57 | 64 | 57 | 58 | 67 | 56 | 60.3 | | | | 55 | 61 | 53½ | |
| 11 | .921 | .910 | .906 | 58 | 63 | 59 | 57 | 62 | 56 | 58.3 | | | | 54 | 59 | 55 | Barometer unusually low in the afternoon. |
| 12 | .936 | .940 | .962 | 57 | 60 | 57 | 55 | 60 | 55 | 56.7 | | | | 55 | 59 | 55 | |
| 13 | .982 | .960 | .956 | 57 | 61 | 55 | 56 | 61 | 52 | 56.3 | | | | 55 | 60 | 49 | Strong gusts of wind from the E. at 7½ p. m. |
| 14 | .952 | .964 | .952 | 55 | 62 | 56 | 55 | 63 | 54 | 57.3 | | | | 54 | 58 | 51 | |
| 15 | .948 | .944 | .946 | 57 | 63 | 55 | 56½ | 64 | 52 | 57.5 | | | | 56 | 59 | 51½ | |
| 16 | .950 | .968 | .974 | 55 | 64 | 60 | 55½ | 64 | 57 | 58.8 | | | | 50 | 57 | 56 | |
| 17 | .982 | .986 | .988 | 57 | 63 | 59 | 57 | 64 | 56 | 59.0 | | | | 54 | 58 | 53 | |
| 18 | .964 | .956 | .946 | 55 | 61 | 57 | 56 | 61 | 54 | 57.0 | | | | 48 | 56 | 52 | |
| 19 | .962 | .946 | .978 | 57 | 61 | 59 | 56 | 61 | 57 | 58.0 | | | | 55 | 58 | 56 | |
| 20 | 24.010 | .984 | 24.016 | 56 | 58 | 57 | 53 | 59 | 56 | 56.0 | | | | 53 | 57 | 54 | |
| 21 | .020 | .996 | .016 | 56 | 58 | 57 | 56 | 60 | 55 | 57.0 | | | | 55 | 58 | 55 | |
| 22 | .000 | .974 | 23.976 | 56 | 62 | 56 | 56 | 63 | 54 | 57.7 | | | | 54 | 57 | 53 | |
| 23 | 23.960 | .956 | .964 | 56 | 62 | 59 | 55 | 65 | 57 | 59.0 | | | | 54½ | 60 | 57 | |
| 24 | .960 | .966 | .960 | 57 | 62 | 59 | 57 | 65 | 60 | 60.7 | | | | 54½ | 59 | 54 | |
| 25 | .964 | .951 | .970 | 57 | 63 | 60 | 55 | 66 | 58 | 59.7 | | | | 54½ | 60 | 57 | |
| 26 | .960 | .948 | .964 | 58 | 61 | 58 | 57 | 62 | 57 | 58.7 | | | | 56½ | 60 | 56 | |
| 27 | .976 | .985 | .974 | 58 | 64 | 60 | 57 | 65 | 59 | 60.3 | | | | 55 | 59 | 57 | |
| 28 | .966 | .960 | .966 | 59 | 60 | 57 | 58 | 59 | 57 | 58.0 | | | | 57½ | 58½ | 53 | |
| 29 | .970 | .952 | .956 | 57 | 58 | 56 | 56 | 58 | 56 | 56.7 | | | | 55 | 57 | 52 | |
| 30 | 23.966 | 23.952 | 23.968 | 56 | 62 | 60 | 55 | 64 | 58 | 59.0 | | | | 54½ | 60 | 57 | |
| Total | 119.125 | 1.864 | 119.190 | ..... | ..... | ..... | 1690½ | 1882 | 1683 | 1.7517 | ..... | ..... | ..... | 1634½ | 1737 | 1699½ | |
| Mean | 23.971 | 23.962 | 23.971 | ..... | ..... | ..... | 56.3 | 62.7 | 56.1 | 58.4 | ..... | ..... | ..... | 54.5 | 58.5 | 54.3 | |
| | 23.968 | | | | | | 58.4 | | | | | | | 55.8 | | | |

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds, (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. July 1 | ..... | ..... | 7 | S. ..... | 2 | ..... | 9 | ..... | ..... | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E.SE.... | 2 | Low ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 2* | ..... | ..... ..... | 3 | E.SE.... | 2½ | ..... | 5 | W..... | 1 | High .... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E.SE..... | 2½ | Low ... | ..... | E.SE..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | .... |
| 3 | ..... | ..... | 8 | S. ..... | 1 | High .. | 9 | ..... | ..... | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | S.SE.... | 2½ | Low .. | ..... | E SE..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | 7.45 p. m.. | 8.10 p. m.. | 5 | SE..... | 2 | High .. | 6 | SE..... | 2 | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | E SE..... | 1 | Low .. | ..... | E.SE..... | 2½ | ..... | ..... | E.SE.... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 5 | 1 p. m ..... | 1.45 p. m.. | 10 | SE..... | 2 | ..... | 8 | S.SE.... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 3.5 p. m... | 3.30 p. m.. | ..... | ..... | ..... | ..... | ..... | S.SE .... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 3.50 p. m.. | 4.10 p. m.. | | | | | | | | | | | | | | | | | | |
| 6 | 4 a. m..... | 4.30 a. m.. | 10 | S.SE .... | 2 | ..... | 10 | SE..... | 2 | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 7.15 a. m.. | 11.30 a. m. | | | | | | | | | | | | | | | | | | |
| | 2.30 p. m.. | 3.15 p. m.. | | | | | | | | | | | | | | | | | | |
| | 7.15 p. m.. | 7.30 p. m.. | | | | | | | | | | | | | | | | | | |
| 7 | 8.15 a. m.. | 10.20 a. m. | 10 | ..... | ..... | Mist & fog. | 10 | ..... | ..... | ... ..... | 10 | ..... | ..... | ..... | NE.... | 1 | ..... | ..... | ..... | ... .. |
| | 4 p. m. .... | 4.45 p. m.. | ..... | ..... | ..... | ..... | ..... | E.SE..... | 2 | Low .... | ..... | ..... .. | ..... | .... .. | ..... | ..... | ..... | ..... | ..... | ..... |
| | 5.30 p. m.. | 7.45 p. m.. | | | | | | | | | | | | | | | | | | |
| 8 | ..... ..... | ..... | 10 | S.SE ... | 2½ | ..... | 8 | S..... | 1 | ..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | SE..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | ..... | ..... | 7 | W ..... .. | 2 | Cirr.... | 6 | W ..... | 2 | Cirr..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.... | 1 |
| | | | | S.SE.... | 2 | ..... | ..... | E. ..... | 2 | Middle .. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | ..... | ..... | 2 | W.. ..... | 2½ | Cirr.... | 9 | S..... | 2½ | ..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| | | | | S..... | 2½ | Low .. | ..... | E.SE..... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 11 | 11.15 a. m. | 1.30 p. m.. | 9 | E. ..... | 1 | Middle | 10 | Stationary | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 2 p. m. .... | 2.45 p. m.. | ..... | ..... | ..... | ..... | ..... | N..... | 1 | Low ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 7.15 p. m.. | 8 p. m. .... | | | | | | | | | | | | | | | | | | |
| 12 | During the | night..... | 10 | S.SE... | 3 | ..... | 10 | ..... | ..... | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 12.10 p. m. | 1.30 p. m.. | ..... | ..... | ..... | ..... | ..... | NE..... | 3 | Low .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 3.15 p. m.. | 5 p. m.... | | | | | | | | | | | | | | | | | | |
| 13 | ..... | ..... | 6 | E... .... | 2 | Middle | 5 | S.SW. .. | 2½ | Middle... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| | | | | S..... | 2½ | Low... | ..... | S.SE.... | 2½ | Low .... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| June 1 | 23.994 | 23.979 | 24.000 | 58 | 63 | 59 | 60 | 68 | 57 | 61.7 | The same as thermometer in open air. | | | 58 | 62½ | 55 | |
| 2 | .976 | .958 | 23.976 | 59 | 62 | 60 | 58 | 64 | 58 | 60.0 | | | | 56½ | 60 | 57 | |
| 3 | .960 | .974 | .992 | 57 | 63 | 59 | 57 | 65 | 57 | 59.7 | | | | 52 | 59 | 54½ | |
| 4 | 24.004 | .988 | .996 | 58 | 64 | 59 | 57 | 64 | 57 | 59.3 | | | | 55 | 59 | 55 | |
| 5 | 23.998 | .972 | .984 | 59 | 64 | 59 | 59 | 65 | 57 | 60.3 | | | | 57 | 61 | 57 | Thunder at 5¾ p. m. |
| 6 | .978 | .954 | .980 | 57 | 58 | 55 | 55½ | 57 | 55 | 55.8 | | | | 53 | 57 | 53½ | |
| 7 | .976 | .960 | .966 | 55 | 61 | 57 | 54 | 60 | 55 | 56.3 | | | | 54 | 56 | 52 | |
| 8 | .982 | .985 | .982 | 55 | 63 | 57 | 55 | 62 | 55 | 57.3 | | | | 52 | 56 | 53½ | |
| 9 | .960 | .950 | .970 | 56 | 62 | 59 | 58 | 64 | 56 | 59.3 | | | | 55 | 56 | 55 | |
| 10 | .948 | .946 | .936 | 57 | 64 | 57 | 58 | 67 | 56 | 60.3 | | | | 55 | 61 | 53½ | |
| 11 | .921 | .910 | .906 | 58 | 63 | 59 | 57 | 62 | 56 | 58.3 | | | | 54 | 59 | 55 | Barometer unusually low in the afternoon. |
| 12 | .936 | .940 | .962 | 57 | 60 | 57 | 55 | 60 | 55 | 56.7 | | | | 55 | 59 | 55 | |
| 13 | .982 | .960 | .956 | 57 | 61 | 55 | 56 | 61 | 52 | 56.3 | | | | 55 | 60 | 49 | Strong gusts of wind from the E. at 7½ p. m. |
| 14 | .952 | .964 | .952 | 55 | 62 | 56 | 55 | 63 | 54 | 57.3 | | | | 54 | 58 | 51 | |
| 15 | .948 | .944 | .946 | 57 | 63 | 55 | 56½ | 64 | 52 | 57.5 | | | | 56 | 59 | 51½ | |
| 16 | .950 | .968 | .974 | 55 | 64 | 60 | 55½ | 64 | 57 | 58.8 | | | | 50 | 57 | 56 | |
| 17 | .982 | .986 | .988 | 57 | 63 | 59 | 57 | 64 | 56 | 59.0 | | | | 54 | 58 | 53 | |
| 18 | .964 | .956 | .946 | 55 | 61 | 57 | 56 | 61 | 54 | 57.0 | | | | 48 | 56 | 52 | |
| 19 | .982 | .946 | .978 | 57 | 61 | 59 | 56 | 61 | 57 | 58.0 | | | | 55 | 58 | 56 | |
| 20 | 24.010 | .984 | 24.016 | 56 | 58 | 57 | 53 | 59 | 56 | 56.0 | | | | 53 | 57 | 54 | |
| 21 | .020 | .996 | .016 | 56 | 58 | 57 | 56 | 60 | 55 | 57.0 | | | | 55 | 58 | 55 | |
| 22 | .000 | .974 | 23.976 | 56 | 62 | 56 | 56 | 63 | 54 | 57.7 | | | | 54 | 57 | 53 | |
| 23 | 23.960 | .956 | .964 | 56 | 62 | 59 | 55 | 65 | 57 | 59.0 | | | | 54½ | 60 | 57 | |
| 24 | .960 | .966 | .960 | 57 | 62 | 59 | 57 | 65 | 60 | 60.7 | | | | 54½ | 59 | 54 | |
| 25 | .964 | .951 | .970 | 57 | 63 | 60 | 55 | 66 | 58 | 59.7 | | | | 54½ | 60 | 57 | |
| 26 | .960 | .948 | .964 | 58 | 61 | 58 | 57 | 62 | 57 | 58.7 | | | | 56½ | 60 | 56 | |
| 27 | .976 | .965 | .974 | 58 | 64 | 60 | 57 | 65 | 59 | 60.3 | | | | 55 | 59 | 57 | |
| 28 | .966 | .960 | .966 | 59 | 60 | 57 | 58 | 59 | 57 | 58.0 | | | | 57½ | 58½ | 53 | |
| 29 | .970 | .952 | .956 | 57 | 58 | 56 | 56 | 58 | 56 | 56.7 | | | | 55 | 57 | 52 | |
| 30 | 23.966 | 23.952 | 23.968 | 56 | 62 | 60 | 55 | 64 | 58 | 59.0 | | | | 54½ | 60 | 57 | |
| Total..... | 119.125 | 1.864 | 119.190 | ..... | ..... | ..... | 1690½ | 1882 | 1683 | 1.7517 | ..... | ..... | ..... | 1634½ | 1737 | 1629½ | |
| Mean..... | 23.971 | 23.969 | 23.971 | ..... | ..... | ..... | 56.3 | 62.7 | 56.1 | 58.4 | ..... | ..... | ..... | 54.5 | 58.5 | 54.3 | |
| | 23.968 | | | | | | 58.4 | | | | | | | 55.8 | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | 6.15 a. m. | 7.45 a. m. | 10 | | 2 | Fog | | | | | | | | | | | | W. | | 1 |
| | 9.15 a. m. | 9.50 a. m. | | E. | | | 9 | | | | 9 | | | | | | | | | |
| | 3.15 p. m. | 4.20 p. m. | | | | | | | | | | | | | | | | | | |
| 30 | 3.25 p. m. | 3.45 p. m. | 6 | Stationary | | | | ESE. | 2 | | | ESE. | 1 | | | | | W | | 2 |
| | 3.55 p. m. | 4.15 p. m. | | | | | | | | | | | | | | | | | | |
| | 4.30 p. m. | 5.10 p. m. | | | | | | | | | | | | | | | | | | |
| 31 | 12.30 p. m. | 12.40 p. m. | 10 | | | Fog | 10 | S.SW. | 1 | | 2 | N. | 2 | | | | | W. | | 2 |
| | 1 p. m. | 3.10 p. m. | | | | | | | | | | | | | | | | | | |
| Total | | | 211 | | | | 258 | | | | 169 | | | | | | | | | |
| Mean | | | 6.8 | | | | 8.3 | | | | 5.4 | | | | | | | | | |

* Gusts of strong wind alternately from E., NE., S., and W., till 7 a. m. July 3; barometer high from 9 a. m. to 1 p. m.

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| July 1 | 23.940 | 23.949 | 23.973 | 57 | 62 | 58 | 57 | 62 | 57 | 58.7 | The same as thermometer in open air. | | | 53 | 59 | 55 | |
| 2 | .966 | .968 | .960 | 57 | 62 | 57 | 58 | 64 | 56 | 59.3 | | | | 55 | 58 | 53 | |
| 3 | .950 | .949 | .932 | 54 | 61 | 57 | 54 | 65 | 55 | 58.0 | | | | 51 | 58 | 53 | |
| 4 | .908 | .920 | .938 | 56 | 64 | 60 | 56 | 66 | 55 | 59.7 | | | | 51 | 59 | 56 | |
| 5 | .946 | .942 | .968 | 59 | 61 | 59 | 57½ | 63 | 59 | 59.8 | | | | 57 | 60 | 58 | |
| 6 | .966 | .945 | .966 | 58 | 61 | 59 | 57 | 62 | 56 | 58.3 | | | | 56 | 60 | 55 | |
| 7 | .944 | .920 | .938 | 58 | 62 | 57 | 57 | 61 | 56 | 58.0 | | | | 57 | 58 | 55½ | |
| 8 | .932 | .940 | .934 | 56 | 62 | 59 | 56 | 64 | 56 | 58.7 | | | | 55 | 59 | 55 | |
| 9 | .936 | .942 | .944 | 56 | 62 | 56 | 56 | 64 | 55½ | 58.5 | | | | 55 | 57 | 52 | |
| 10 | .944 | .960 | .962 | 57 | 63 | 58 | 57 | 65 | 55 | 59.0 | | | | 55 | 60 | 53 | |
| 11 | .958 | .956 | .984 | 55 | 61 | 59 | 56 | 60 | 57 | 57.7 | | | | 51 | 60 | 55 | |
| 12 | .928 | .970 | .994 | 56 | 58 | 56 | 54 | 59 | 55 | 56.0 | | | | 52 | 58 | 54 | |
| 13 | 24.009 | .994 | .998 | 58 | 61 | 57 | 57 | 62 | 55 | 58.0 | | | | 56 | 58 | 54½ | |
| 14 | .010 | 24.020 | 24.006 | 57 | 65 | 59 | 56 | 66 | 56 | 60.0 | | | | 55 | 62 | 55 | |
| 15 | .010 | .011 | 23.994 | 56 | 64 | 56 | 58½ | 68 | 54 | 60.1 | | | | 54½ | 61 | 52 | |
| 16 | 23.978 | 23.968 | .976 | 56 | 63 | 59 | 58 | 65 | 56 | 59.7 | | | | 55 | 60 | 55 | |
| 17 | .968 | .972 | .964 | 55 | 62 | 59 | 56 | 65 | 55 | 58.7 | | | | 54½ | 58 | 54 | |
| 18 | .977 | .960 | .978 | 58 | 63 | 56 | 57 | 65 | 54 | 58.7 | | | | 55 | 60 | 53 | Thunder. |
| 19 | .964 | .970 | .956 | 56 | 60 | 55 | 56 | 57 | 53 | 55.3 | | | | 54 | 57 | 51 | |
| 20 | .942 | .944 | .962 | 56 | 61 | 58 | 58 | 59 | 56 | 57.7 | | | | 54½ | 57 | 55 | |
| 21 | .938 | .928 | .943 | 56 | 61 | 61 | 55 | 62 | 58½ | 58.5 | | | | 55 | 59 | 58½ | |
| 22 | .944 | .942 | .948 | 57 | 63 | 60 | 56 | 64 | 59 | 59.7 | | | | 55 | 60 | 58 | |
| 23 | .935 | .932 | .950 | 59 | 62 | 57 | 57 | 59 | 56 | 57.3 | | | | 56 | 58 | 54 | |
| 24 | .940 | .955 | .962 | 56 | 60 | 58 | 55 | 60 | 56 | 57.0 | | | | 55 | 58 | 54 | |
| 25 | .958 | .977 | .956 | 56 | 63 | 56 | 55 | 62 | 57 | 58.0 | | | | 53 | 57 | 56 | |
| 26 | .976 | .975 | .980 | 57 | 63 | 61 | 55½ | 64 | 59 | 59.5 | | | | 54 | 58½ | 58 | |
| 27 | .992 | .982 | .984 | 57 | 63 | 60 | 56 | 63 | 56 | 58.3 | | | | 55 | 61 | 55 | |
| 28 | .980 | .974 | .974 | 57 | 64 | 60 | 57 | 66 | 58 | 60.3 | | | | 55 | 61 | 57 | |
| 29 | .978 | .992 | .996 | 59 | 63 | 58 | 56 | 65 | 55 | 58.7 | | | | 56 | 60 | 54 | |
| 30 | .988 | .992 | 24.016 | 57 | 64 | 60 | 58 | 65 | 58 | 60.3 | | | | 55 | 60 | 57 | Thunder, very faint, at 5 p. m. |
| 31 | 24.000 | .976 | 23.984 | 58 | 59 | 59 | 57 | 59 | 56 | 57.3 | | | | 57 | 58 | 55 | |
| Total.... | 122.849 | 121.818 | 123.020 | ..... | ..... | ..... | 1749½ | 1953 | 1742 | 181.48 | ..... | ..... | ..... | 1692½ | 1829½ | 1700½ | |
| Mean.... | 23.963 | 23.962 | 23.958 | ..... | ..... | ..... | 56.4 | 63.0 | 56.2 | 58.5 | ..... | ..... | ..... | 54.6 | 59.0 | 54.9 | |
| | 23.964 | | | | | | 58.5 | | | | | | | 56.2 | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 30 | [illegible] p. m. | [illegible] p. m. | | | | | | | | | | | | | | | | | | |
| | 3.25 p. m. | 3.45 p. m. | 6 | Stationary | ..... | ..... | 9 | ..... | ..... | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W. . | 2 |
| | 3.55 p. m. | 4.15 p. m. | ..... | ..... | ..... | ..... | ..... | E.SE. . | 2 | ..... | ..... | E.SE.... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 4.30 p. m. | 5.10 p. m. | | | | | | | | | | | | | | | | | | |
| 31 | 12.30 p. m. | 12.40 p. m. | 10 | ..... | ..... | Fog.... | 10 | S.SW. . | 1 | ..... | 2 | N..... | 2 | ..... | ..... | ..... | ..... | ..... | W.... | 2 |
| | 1 p. m.... | 3.10 p. m. | | | | | | | | | | | | | | | | | | |
| Total..... | ..... | ..... | 211 | ..... | ..... | ..... | 258 | ..... | ..... | ..... | 169 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean..... | ..... | ..... | 6.8 | ..... | ..... | ..... | 8.3 | ..... | ..... | ..... | 5.4 | ..... | ..... | ..... | ..... | ..... | ..... | .... | ..... | ..... |

* Gusts of strong wind alternately from E., NE., S., and W., till 7 a. m. July 3; barometer high from 9 a. m. to 1 p. m.

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds, (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. Aug. 14 | 12.20 p. m. | 12.30 p. m. | 9 | E.SE .... | 1 | ..... | 10 | NE.&E.SE | 1 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 2½ |
| | 1.5 p. m... | 1.55 p. m.. | | | | | | | | | | | | | | | | | | |
| | 2.10 p. m.. | 3 p. m..... | | | | | | | | | | | | | | | | | | |
| 15 | 1.55 p. m.. | 3.45 p. m.. | 3 | SW .. .. | 2 | ..... | 10 | ..... | ..... | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 8.45 p m.. | 9.30 p. m.. | ..... | ..... | ..... | ..... | ..... | E ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 16 | 7.30 a. m.. | 9 a. m..... | 10 | NE. & SE | 2 | ..... | 10 | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 2½ |
| | 9.15 a. m.. | 1.30 p. m.. | | | | | | | | | | | | | | | | | | |
| | 2.30 p. m.. | 4 p. m.... | | | | | | | | | | | | | | | | | | |
| | 4.30 p. m.. | 5.30 p m.. | | | | | | | | | | | | | | | | | | |
| 17 | 7.30 a. m.. | 11 a. m.... | 10 | NE .... and E SE | 2 2 | Mist.. | 10 | S.SW.... and E... | 2 2 | ..... | 1 | ..... | ..... | ..... | ..... | .... | ..... | ..... | W .... | 2 |
| | 12.15 p. m. | 1.50 p. m.. | | | | | | | | | | | | | | | | | | |
| | 3.5 p. m... | 4 p. m..... | | | | | | | | | | | | | | | | | | |
| 18 | 2.30 p. m.. | 2.40 p. m.. | 8 | W.E .... E ..... | 1 2 | High .. Middle | 7 | E.NE ... E ..... S .. .. | 1 2½ 2½ | High .... Middle .. Low .... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | E.NE. | 2 |
| 19 | 9.15 a. m.. | 11.30 a. m. | 10 | NE ..... and E.SE | 1 1 | High .. Middle | 10 | E ..... | 1 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 11.45 a. m. | 8.30 p. m.. | | | | | | | | | | | | | | | | | | |
| | 10 p. m.... | 12 p. m.... | | | | | | | | | | | | | | | | | | |
| 20 | 12.30 a. m. | 6 a. m..... | 10 | ..... | ..... | Fog.... | 10 | SW..... and S.SE. | 2 2 | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 2 |
| | 6.10 a. m.. | 8 a. m..... | | | | | | | | | | | | | | | | | | |
| 21 | 5 p. m..... | 7.15 p. m.. | 10 | SE ..... | 2 | ..... | 7 | S..... | 2½ | ..... | 10 | ..... | ..... | ..... | ..... | .... | ..... | ..... | ..... | ..... |
| 22 | 3.45 p. m.. | 5 p. m..... | 5 | SE..... | 2½ | ..... | 10 | S.SE .... | 2½ | ..... | 10 | ..... | ..... | Mist... | ..... | ..... | ..... | ..... | ..... | ..... |
| 23 | 2.45 p. m.. | 4.15 p. m.. | 10 | ..... | ..... | Fog.... | 10 | E ..... | 2½ | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 24 | ..... | ..... | 10 | N ..... | 2½ | Fog.... | 8 | E ..... and SE.. | 2½ 2½ | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | ..... | ..... | 3 | E..... | 2 | Middle | 7 | E ..... | 2 | Middle .. | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 26 | 1.15 p. m.. | 1.30 p. m.. | 1 | N. NE..... | 2 2½ | High .. Middle | 10 | SE..... | 1 | ..... | 10 | ..... | ..... | ..... | NE., in gusts. | 3 | ..... | ..... | ..... | ..... |
| | | | | air unusually dry | | | | | | | | | | | | | | | | |
| 27 | 4.20 a. m.. | 6.15 a. m.. | 10 | SE..... | 2 | Middle | 10 | S.SE.... S ..... | 2 2½ | High .... Middle .. | 8 | S ..... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | .... |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 28 | 6.50 a. m. | 7.30 a. m. | 4 | S. | 3 | | 5 | S. | 3 | | 2 | | | | | | | | | |
| 29 | | | 7 | S. | 3 | | 10 | S. | 3 | | 9 | S.SE. | 2½ | | | | | | | |
| | | | | | | | | E. | 2½ | | | | | | | | | | | |
| 30 | 4 p. m. | 5.15 p. m. | 7 | S. | 1 | Cirr. | 8 | NE. | 2 | High | 4 | Station'y | | | | | | | | |
| | | | | S.SE. | 2½ | Middle | | SE. | 1 | Middle | | | | | | | | | | |
| 31 | 1.30 p. m. | 2 p. m. | 8 | W. | 1 | Cirr. | 10 | | | | 4 | | | | | | | | W. | 1 |
| | | | | E. | 2 | Middle | | | | | | | | | | | | | | |
| | 2.25 p. m. | 3.50 p. m. | | | | | | E. | 2 | Low | | | | | | | | | | |
| Total | | | 231 | | | | 276 | | | | 224 | | | | | | | | | |
| Mean | | | 7.5 | | | | 8.9 | | | | 7.2 | | | | | | | | | |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. | | | | | | | | | | | | | | | | | | | | |
| Sept. 20 | 11.55 a. m. | 1.10 p. m.. | 5 | W .....<br>S ..... | 1<br>2 | H .....<br>M..... | 10 | Stationary | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 2 |
| | 1.40 p. m..<br>4.40 p. m..<br>7.15 p. m.. | 2.45 p. m..<br>5 p. m.....<br>8.45 p. m.. | | | | | | | | | | | | | | | | | | |
| 21 | ..... | ..... | 1 | ..... | ..... | ..... | 9 | S .....<br>E ..... | 3<br>2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 22 | 12.30 p. m. | 1.30 p. m.. | 2 | N ..... | 1 | H ..... | 9 | S .....<br>and E.SE | 2<br>2 | M..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 3.50 p. m..<br>4.30 p. m. | 4.30 p. m..<br>5.10 p. m.. | | | | | | | | | | | | | | | | | | |
| 23 | 1 p. m..... | 3.5 p. m... | 8 | N ..... | 1 | H ..... | 10 | SE..... | 1 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 24 | ..... | ..... | 5 | W ..... | 1 | H ... | 7 | SE..... | 2 | ..... | 8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | 8.30 a. m.. | 8.45 a. m.. | 7 | W.SW ...<br>SE..... | 2<br>2 | Cirr...<br>M..... | 10 | S ..... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 10.25 a. m.<br>1.30 p. m.. | 12.10 p. m.<br>4.50 p. m.. | ..... | ..... | ..... | ..... | ..... | E ..... | 1 | | | | | | | | | | | |
| 26 | Greater part of last night<br>till 6.30 a. m. | | 10 | S.SE..... | 2 | ..... | 10 | SE..... | 2 | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W .... | 1 |
| 27 | ..... | ..... | 3 | W ..... | 2 | H .... | 9 | S ..... | 2 | ..... | 4 | E ..... | 2 | ..... | ..... | ..... | ..... | ..... | W ... | 2 |
| 28 | ..... | ..... | 3 | ..... | ..... | ..... | 10 | SE..... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W ... | 2 |
| 29 | 8.30 p. m.. | 9.15 p. m.. | 3 | ..... | ..... | ..... | 9 | SE..... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | 1 p. m..... | 2.35 p. m.. | 10 | Stationary<br>SE..... | .....<br>1 | H .....<br>M..... | 10 | E..... | 1 | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 3 p. m.....<br>5.50 p. m.. | 3.15 p. m..<br>7 p. m..... | | | | | | | | | | | | | | | | | | |
| Total.... | ..... | ..... | 168 | ..... | ..... | ..... | 240 | ..... | ..... | ..... | 181 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean..... | ..... | ..... | 5.6 | ..... | ..... | ..... | 8.0 | ..... | ..... | ..... | 6.0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer att. 7 A. M. | Barometer. Thermometer att. 2 P. M. | Barometer. Thermometer att. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Sept. 1 | 23.946 | 23.942 | 23.938 | 56 | 63 | 55 | 57 | 62 | 55 | 58.0 | The same as thermometer in open air. | | | 51¼ | 60 | 51 | |
| 2 | .930 | .942 | .978 | 56 | 61 | 58 | 56 | 61 | 56 | 57.7 | | | | 55 | 59 | 56 | |
| 3 | .954 | .976 | .980 | 57 | 64 | 59 | 57 | 66 | 59 | 60.7 | | | | 56½ | 61 | 55 | |
| 4 | .972 | .974 | .988 | 59 | 65 | 59 | 57 | 66 | 56 | 59.7 | | | | 56 | 61 | 55 | Thunder at 4h.15 p. m. |
| 5 | 24.000 | .994 | 24.004 | 60 | 65 | 59 | 57 | 67 | 57 | 60.3 | | | | 57 | 62 | 55 | Thunder and lightning more energetic than usual at 5 p. m. |
| 6 | 23.973 | .976 | 23.992 | 57 | 65 | 61 | 59 | 68 | 59 | 62.0 | | | | 56 | 61 | 58 | |
| 7 | .970 | .968 | .988 | 59 | 63 | 59 | 59 | 62 | 57 | 59.3 | | | | 57¼ | 60 | 56 | |
| 8 | .985 | .985 | 24.004 | 58 | 62 | 58 | 56 | 64 | 57 | 59.0 | | | | 56 | 57 | 54 | |
| 9 | .980 | .988 | 24.012 | 57 | 63 | 59 | 58 | 66 | 57 | 60.3 | | | | 54 | 61 | 55 | |
| 10 | 24.016 | 24.012 | 24.038 | 58 | 64 | 61 | 58 | 67 | 59 | 61.3 | | | | 56 | 60 | 58 | |
| 11 | 24.028 | 24.004 | 23.992 | 58 | 65 | 58 | 60 | 66 | 55 | 60.3 | | | | 54 | 62 | 49 | |
| 12 | 23.950 | 23.952 | .956 | 58 | 64 | 56 | 57 | 69 | 53 | 59.7 | | | | 50 | 61 | 52 | Temp. at sunrise, 51°. |
| 13 | .940 | .934 | .976 | 58 | 64 | 60 | 56 | 65 | 59 | 60.0 | | | | 55 | 61 | 58 | |
| 14 | .970 | .970 | .988 | 59 | 61 | 59 | 56 | 61 | 57 | 58.0 | | | | 55 | 59 | 55 | |
| 15 | .964 | .970 | .980 | 59 | 64 | 60 | 58 | 68 | 56 | 60.7 | | | | 56 | 61 | 55 | |
| 16 | .950 | .938 | .964 | 57 | 66 | 61 | 58 | 68 | 59 | 61.7 | | | | 54 | 60 | 57 | |
| 17 | .948 | .942 | .950 | 56 | 64 | 61 | 58 | 70 | 57 | 61.7 | | | | 54 | 62 | 56 | |
| 18 | .956 | .944 | .972 | 59 | 60 | 58 | 57 | 57 | 57 | 57.0 | | | | 56½ | 56 | 53 | |
| 19 | .960 | .960 | .968 | 58 | 63 | 59 | 58 | 63 | 57 | 59.3 | | | | 55 | 60 | 55 | |
| 20 | .947 | .948 | .980 | 59 | 64 | 59 | 59 | 62 | 58 | 59.7 | | | | 57 | 61 | 55 | Thunder at 5h.45 p. m. |
| 21 | .972 | .972 | .972 | 58 | 65 | 60 | 59 | 66 | 56 | 60.3 | | | | 57 | 61 | 55 | |
| 22 | .958 | .962 | .974 | 55 | 64 | 61 | 55 | 65 | 59 | 59.7 | | | | 50½ | 61 | 58 | Temp. at sunrise, 49°. |
| 23 | .944 | .938 | .960 | 58 | 63 | 60 | 59 | 62 | 56 | 59.0 | | | | 57 | 60 | 55 | |
| 24 | .934 | .944 | .956 | 57 | 63 | 60 | 60 | 67 | 58 | 61.7 | | | | 55 | 60½ | 56 | |
| 25 | .964 | .936 | .993 | 59 | 60 | 58 | 59 | 60 | 58 | 59.0 | | | | 57 | 59 | 57 | |
| 26 | .968 | .946 | .960 | 57 | 61 | 59 | 56 | 62 | 56 | 58.0 | | | | 54 | 58 | 55 | |
| 27 | .940 | .939 | .960 | 56 | 63 | 57 | 57 | 64 | 54 | 58.3 | | | | 54 | 60 | 52½ | |
| 28 | .950 | .966 | .974 | 54 | 63 | 58 | 57 | 64 | 56 | 59.0 | | | | 53 | 60 | 54 | |
| 29 | .968 | .954 | .976 | 58 | 65 | 62 | 59 | 67 | 59 | 61.7 | | | | 55 | 60 | 58 | Thunder at 8h.15 p. m. |
| 30 | .962 | .946 | .975 | 60 | 64 | 61 | 59 | 63 | 59 | 60.3 | | | | 57 | 61 | 57½ | Lightning at 6h.15 p. m. |
| Total..... | 118.889 | 118.822 | 119.348 | ..... | ..... | ..... | 1731 | 1938 | 1711 | 1793.4 | ..... | ..... | ..... | 1651½ | 1805½ | 1656 | |
| Mean..... | 23.963 | 23.961 | 23.978 | ..... | ..... | ..... | 57.7 | 64.6 | 57.0 | 59.8 | ..... | ..... | ..... | 55.0 | 60.2 | 55.2 | |
| | 23.967 | | | | | | 59.8 | | | | | | | 56.8 | | | |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. August 1 | 23.976 | 23.972 | 23.992 | 58 | 63 | 59 | 58 | 64 | 56 | 59.3 | The same as thermometer in open air. | | | 56 | 60 | 55 | |
| 2 | .948 | .954 | .976 | 56 | 62 | 60 | 55½ | 65 | 59 | 59.8 | | | | 54 | 61 | 58 | |
| 3 | .952 | .992 | .978 | 59 | 63 | 61 | 59 | 60 | 59 | 59.3 | | | | 57½ | 59 | 58½ | Thunder at 4h.30 p. m. |
| 4 | .952 | .940 | .958 | 59 | 63 | 60 | 58 | 64 | 57 | 59.7 | | | | 56 | 62 | 57 | |
| 5 | .930 | .928 | .939 | 59 | 60 | 58 | 57 | 61 | 55 | 57.7 | | | | 57 | 59½ | 55 | |
| 6 | .924 | .936 | .960 | 56 | 62 | 60 | 58 | 61 | 58 | 59.0 | | | | 55 | 58 | 58 | Thunder at 9 p. m. |
| 7 | .948 | .940 | 23.966 | 60 | 60 | 58 | 58 | 58 | 57 | 57.7 | | | | 57 | 57 | 56 | |
| 8 | .968 | .968 | 24.000 | 58 | 62 | 61 | 56 | 64 | 59 | 59.7 | | | | 56 | 63 | 58 | |
| 9 | 23.986 | 23.994 | .008 | 59 | 60 | 56 | 57 | 58½ | 55 | 56.8 | | | | 57 | 58 | 53 | |
| 10 | 24.004 | 24.004 | .008 | 57 | 62 | 59 | 57 | 62 | 57 | 58.7 | | | | 54 | 60½ | 57 | |
| 11 | 23.986 | 23.996 | .006 | 57 | 63 | 58 | 57 | 66 | 57½ | 60.2 | | | | 56 | 59 | 56½ | |
| 12 | 24.022 | .998 | .042 | 58 | 64 | 58 | 57 | 66 | 55 | 59.3 | | | | 55 | 61 | 54 | Thunder at 6 p. m. |
| 13 | 24.002 | .988 | 24.023 | 58 | 60 | 59 | 56 | 60 | 56 | 57.3 | | | | 55 | 59 | 55½ | |
| 14 | 24.000 | .990 | 23.992 | 57 | 59 | 56 | 56 | 56 | 55 | 55.7 | | | | 55 | 56 | 53 | |
| 15 | 23.956 | .942 | 23.970 | 56 | 61 | 60 | 56 | 60 | 57½ | 57.8 | | | | 55 | 59½ | 57 | Thunder at 8h.45 p. m. |
| 16 | 23.968 | 23.966 | 24.008 | 59 | 59 | 57 | 56 | 58 | 56 | 56.7 | | | | 55 | 57 | 55 | |
| 17 | 24.008 | 24.002 | 24.000 | 57 | 59 | 56 | 55 | 58 | 55 | 56.0 | | | | 55 | 56 | 54 | |
| 18 | 23.986 | 24.002 | 24.004 | 57 | 63 | 58 | 59 | 65 | 57 | 60.3 | | | | 55 | 60 | 54 | |
| 19 | .952 | 23.908 | 23.942 | 57 | 60 | 58 | 56 | 58 | 55½ | 56.5 | | | | 55 | 57½ | 55½ | |
| 20 | .972 | .980 | .994 | 56 | 58 | 56 | 54 | 58 | 56 | 56.0 | | | | 54 | 57 | 54 | |
| 21 | .992 | .984 | .996 | 57 | 62 | 59 | 57 | 66 | 57 | 60.0 | | | | 55 | 64 | 57 | |
| 22 | .980 | .984 | 23.990 | 57 | 62 | 59 | 57 | 64 | 57 | 59.3 | | | | 56 | 62 | 57 | |
| 23 | .984 | 23.990 | 24.018 | 57 | 60 | 59 | 56 | 60 | 56 | 57.3 | | | | 56 | 59 | 56 | |
| 24 | 24.020 | 24.038 | .056 | 57 | 61 | 60 | 55 | 64 | 58 | 59.0 | | | | 55 | 60 | 57 | |
| 25 | .046 | .052 | .042 | 58 | 63 | 59 | 60 | 65 | 56 | 60.3 | | | | 56½ | 60 | 52 | |
| 26 | .022 | .016 | .032 | 57 | 61 | 59 | 57 | 61 | 57 | 58.3 | | | | 51 | 57 | 56½ | |
| 27 | .024 | .008 | .028 | 59 | 63 | 60 | 56 | 66 | 56 | 59.3 | | | | 56 | 64 | 56 | |
| 28 | .022 | .012 | .014 | 56 | 63 | 59 | 56 | 63 | 56 | 58.3 | | | | 54 | 58 | 55 | |
| 29 | .022 | .010 | .042 | 58 | 61 | 60 | 57 | 63 | 59 | 59.7 | | | | 55½ | 60 | 57½ | |
| 30 | 24.041 | 24.022 | 24.022 | 59 | 65 | 59 | 59 | 65 | 55 | 59.7 | | | | 57 | 59 | 53 | |
| 31 | 23.995 | 23.962 | 23.966 | 57 | 63 | 58 | 58 | 61 | 55 | 58.0 | | | | 53 | 60 | 53 | |
| Total.... | 123.588 | 123.478 | 123.972 | ..... | ..... | ..... | 1763½ | 1920½ | 1754½ | 181.27 | ..... | ..... | ..... | 1714½ | 1843 | 1724 | |
| Mean.... | 23.967 | 23.983 | 23.999 | ..... | ..... | ..... | 56.9 | 62.0 | 56.6 | 58.5 | ..... | ..... | ..... | 55.3 | 59.5 | 55.6 | |
| | 23.990 | | | | | | 58.5 | | | | | | | 56.8 | | | |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 7.30 p. m.. | 8.10 p. m.. | | | | | | | | | | | | | | | | | | | |
| | 8.45 p. m.. | 9.30 p. m.. | | | | | | and E.... | 1 | | | | | | | | | | | | |
| 21 | 3.30 a. m.. | 4.15 a. m.. | 10 | | | Fog... | 10 | N..... | 2 | | 10 | | | | | | | | | | |
| | 8 a. m. . | 11.15 a. m. | | | | | | E..... | 1 | | | | | | | | | | | | |
| | 11.50 a. m. | 3.30 p. m.. | | | | | | | | | | | | | | | | | | | |
| 22 | 2.25 p. m.. | 3.50 p. m.. | 10 | | | | 9 | S..... | 2 | | 3 | S..... | 1 | | | | | | | | |
| | 4.15 p. m.. | 5.10 p. m.. | | E..... | 1 | Fog... | | | | | | | | | | | | | | | |
| 23 | 5.15 p. m.. | 5.30 p m.. | 10 | SE..... | 2 | | 6 | E.S.E.... | 2½ | | 4 | | | | | | | | | | |
| 24 | 12.35 p. m. | 6.20 p. m.. | 4 | N..... | 1 | High.. | 10 | S.E..... | 1 | | 3 | | | | | | | | | W..... | 1 |
| 25 | 12.20 p. m. | 12.35 p. m. | 1 | | | | 9 | S..... | 2 | | 8 | E.SE... | 2 | | | | | | | | |
| | 7.40 p. m.. | 7.55 p. m.. | | | | | | E..... | 2 | | | | | | | | | | | | |
| 26 | 2.50 p. m.. | 3.10 p. m.. | 3 | SE..... | 2 | | 9 | S.S.E.... | 2 | | 10 | | | | | | | | | W..... | 1 |
| | 4.20 p. m.. | 4.50 p. m.. | | | | | | E..... | 2 | | | | | | | | | | | | |
| 27 | | | 10 | E..... | 2½ | Fog.... | 6 | S.E. .... | 2½ | | 9 | S..... | 2½ | | | | | | | | |
| 28 | 11.30 a. m. | 12.10 p. m. | 3 | SE..... | 2 | | 9 | S.E. .... | 2 | | 7 | Station'y | | High.. | | | | | | | |
| | 1 p. m..... | 1.45 p. m.. | | | | | | | | | | | | | | | | | | | |
| | 1.55 p. m.. | 3.40 p. m.. | | | | | | | | | | | | | | | | | | | |
| 29 | | | 3 | W..... | 1 | High.. | 6 | S.E. .... | 2 | | 2 | | | | | | | | | | |
| | | | | S..... | 2 | Middle. | | | | | | | | | | | | | | | |
| 30 | 4.10 p. m.. | 4.30 p. m.. | 3 | E.S.E... | 2 | High.. | 8 | S.E..... | 2½ | | 7 | S..... | 3 | | | | | | | | |
| 31 | 12.20 p. m. | 12.40 p. m. | 6 | S.SE..... | 1 | | 9 | S.E..... | 2 | | 3 | | | | | | | | | | |
| | 2.55 p. m. | 3.50 p. m.. | | | | | | | | | | | | | | | | | | | |
| Total... | | | 160 | | | | 251 | | | | 174 | | | | | | | | | | |
| Mean.. | | | 5.2 | | | | 8.1 | | | | 5.6 | | | | | | | | | | |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A.M. | Barometer. Height. 2 P.M. | Barometer. Height. 9 P.M. | Barometer. Thermometer attached. 7 A.M. | Barometer. Thermometer attached. 2 P.M. | Barometer. Thermometer attached. 9 P.M. | Thermometer in open air. 7 A.M. | Thermometer in open air. 2 P.M. | Thermometer in open air. 9 P.M. | Thermometer in open air. Mean. | Psychrometer. Dry Bulb. 7 A.M. | Psychrometer. Dry Bulb. 2 P.M. | Psychrometer. Dry Bulb. 9 P.M. | Psychrometer. Wet bulb. 7 A.M. | Psychrometer. Wet bulb. 2 P.M. | Psychrometer. Wet bulb. 9 P.M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| October 1 | 23.964 | 23.952 | 23.972 | 59 | 64 | 59 | 58 | 67 | 57 | 60.7 | The same as thermometer in open air. | | | 57 | 63 | 55 | |
| 2 | .960 | .946 | .954 | 58 | 64 | 60 | 59 | 65 | 58 | 60.7 | | | | 55 | 60 | 55 | |
| 3 | .948 | .948 | .978 | 58 | 65 | 61 | 58 | 66 | 57 | 60.3 | | | | 56 | 60 | 56 | |
| 4 | .962 | .956 | .973 | 59 | 65 | 60 | 59 | 66 | 57 | 60.7 | | | | 56 | 63 | 55 | |
| 5 | .972 | .962 | .992 | 59 | 63 | 57 | 58 | 63 | 57 | 59.3 | | | | 57 | 61 | 54 | |
| 6 | 24.002 | .984 | 24.016 | 57 | 63 | 60 | 58 | 64 | 57 | 59.7 | | | | 54½ | 61 | 56 | |
| 7 | 24.006 | .978 | 24.012 | 58 | 62 | 59 | 58 | 67 | 56 | 60.3 | | | | 57 | 62 | 55 | |
| 8 | 24.000 | .996 | 24.015 | 57 | 61 | 58 | 56 | 61 | 56 | 57.7 | | | | 55 | 60 | 55 | |
| 9 | 24.022 | 24.014 | 24.022 | 57 | 64 | 60 | 58 | 64 | 59 | 60.3 | | | | 56 | 60 | 58 | |
| 10 | 23.978 | 23.988 | 23.988 | 55 | 66 | 61 | 59 | 68 | 58 | 61.7 | | | | 53 | 57 | 57 | |
| 11 | .950 | .958 | .944 | 55 | 65 | 57 | 56 | 66 | 56 | 59.3 | | | | 52 | 61 | 48 | Thunder at 4 p. m. |
| 12 | .934 | .943 | .945 | 55 | 64 | 58 | 58 | 64 | 58 | 60.0 | | | | 51½ | 59 | 56 | Temperature at 6h.15, a.m., 51°. |
| 13 | .933 | .932 | .934 | 56 | 65 | 61 | 58 | 67 | 57 | 60.7 | | | | 55 | 61½ | 57 | |
| 14 | .926 | .910 | .932 | 56 | 62 | 56 | 56 | 62 | 55 | 57.7 | | | | 55 | 60½ | 51 | |
| 15 | .916 | .923 | .943 | 57 | 64 | 59 | 59 | 67 | 56 | 60.7 | | | | 53 | 61 | 55 | Thunder at 7 p. m. |
| 16 | .943 | .951 | .972 | 56 | 63 | 60 | 57 | 65 | 57 | 59.7 | | | | 55 | 61 | 56 | |
| 17 | .956 | .938 | .968 | 57 | 62 | 57 | 58 | 60 | 55 | 57.7 | | | | 57 | 59 | 54 | |
| 18 | .930 | .920 | .930 | 56 | 60 | 57 | 56 | 63 | 55 | 58.0 | | | | 55 | 60 | 53 | |
| 19 | .928 | .912 | .946 | 57 | 59 | 58 | 57 | 60 | 56 | 57.7 | | | | 55 | 59 | 55 | |
| 20 | .940 | .912 | .951 | 58 | 59 | 58 | 56 | 58 | 57 | 57.0 | | | | 55 | 58 | 57 | |
| 21 | .943 | .912 | .956 | 57 | 58 | 57 | 56 | 56 | 56 | 56.0 | | | | 56 | 56 | 56 | |
| 22 | .952 | .939 | .962 | 57 | 61 | 57 | 56 | 61 | 55 | 57.3 | | | | 56 | 59 | 53 | |
| 23 | .972 | .972 | .976 | 57 | 64 | 59 | 56 | 66 | 57 | 59.7 | | | | 55 | 56 | 56 | |
| 24 | .959 | .920 | .940 | 56 | 60 | 58 | 57 | 59 | 56 | 57.3 | | | | 54 | 58 | 54½ | Thunder at 3h.30 p. m. |
| 25 | .933 | .916 | .938 | 56 | 61 | 61 | 57 | 64 | 58 | 59.7 | | | | 55 | 60 | 57 | |
| 26 | .934 | .922 | .959 | 57 | 66 | 60 | 59 | 61 | 57 | 60.0 | | | | 57 | 61 | 56½ | |
| 27 | .956 | .952 | .980 | 60 | 64 | 61 | 57 | 66 | 59 | 60.7 | | | | 57 | 61 | 58 | |
| 28 | .983 | .962 | 24.000 | 58 | 63 | 60 | 59 | 65 | 58 | 60.7 | | | | 57 | 61 | 50 | |
| 29 | .980 | .954 | 23.986 | 57 | 64 | 59 | 58 | 66 | 56 | 60.0 | | | | 56 | 61 | 55 | |
| 30 | .966 | .940 | .956 | 59 | 64 | 61 | 61 | 65 | 60 | 62.0 | | | | 59 | 62 | 59 | |
| 31 | .947 | .931 | .952 | 59 | 63 | 59 | 62 | 64 | 55 | 60.3 | | | | 60 | 62 | 54 | |
| Total..... | 122.694 | 122.343 | 122.962 | ..... | ..... | ..... | 1790 | 1979 | 1761 | 1843.6 | ..... | ..... | ..... | 1792 | 1867 | 1713 | |
| Mean..... | 23.958 | 23.947 | 23.907 | ..... | ..... | ..... | 57.7 | 63.8 | 56.8 | 59.47 | ..... | ..... | ..... | 55.5 | 60.2 | 55.3 | |
| | 23.957 | | | | | | 59.43 | | | | | | | 57.0 | | | |

*Register of Meteorological Observations*—Continued.

| y of the onth. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer att. 7 A. M. | Barometer. Thermometer att. 2 P. M. | Barometer. Thermometer att. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| 1 | 23.946 | 23.942 | 23.938 | 56 | 63 | 55 | 57 | 62 | 55 | 58.0 | The same as thermometer in open air. | | | 51½ | 60 | 51 | |
| 2 | .930 | .942 | 978 | 56 | 61 | 58 | 56 | 61 | 56 | 57.7 | | | | 55 | 59 | 56 | |
| 3 | .954 | .976 | .980 | 57 | 64 | 59 | 57 | 66 | 59 | 60.7 | | | | 56½ | 61 | 55 | |
| 4 | .972 | .974 | .988 | 59 | 65 | 59 | 57 | 66 | 56 | 59.7 | | | | 56 | 61 | 55 | Thunder at 4h.15 p. m. |
| 5 | 24.000 | .994 | 24.004 | 60 | 65 | 59 | 57 | 67 | 57 | 60.3 | | | | 57 | 62 | 55 | Thunder and lightning more energetic than usual at 5 p. m. |
| 6 | 23.973 | .976 | 23.992 | 57 | 65 | 61 | 59 | 68 | 59 | 62.0 | | | | 56 | 61 | 58 | |
| 7 | .970 | .968 | .988 | 59 | 63 | 59 | 59 | 62 | 57 | 59.3 | | | | 57½ | 60 | 56 | |
| 8 | .985 | .985 | 24.004 | 58 | 62 | 58 | 56 | 64 | 57 | 59.0 | | | | 56 | 57 | 54 | |
| 9 | .980 | .988 | 24.012 | 57 | 63 | 59 | 58 | 66 | 57 | 60.3 | | | | 54 | 61 | 55 | |
| 10 | 24.016 | 24.012 | 24.038 | 58 | 64 | 61 | 58 | 67 | 59 | 61.3 | | | | 56 | 60 | 58 | |
| 11 | 21.028 | 24.004 | 23.992 | 58 | 65 | 58 | 60 | 66 | 55 | 60.3 | | | | 54 | 62 | 49 | |
| 12 | 23.950 | 23.952 | .956 | 58 | 64 | 56 | 57 | 69 | 53 | 59.7 | | | | 50 | 61 | 52 | Temp. at sunrise, 51°. |
| 13 | .940 | .934 | .976 | 58 | 64 | 60 | 56 | 65 | 59 | 60.0 | | | | 55 | 61 | 58 | |
| 14 | .970 | .970 | .988 | 59 | 61 | 59 | 56 | 61 | 57 | 58.0 | | | | 55 | 59 | 55 | |
| 15 | .964 | .970 | .980 | 59 | 64 | 60 | 58 | 68 | 56 | 60.7 | | | | 56 | 61 | 55 | |
| 16 | .950 | .938 | .964 | 57 | 66 | 61 | 58 | 68 | 59 | 61.7 | | | | 54 | 60 | 57 | |
| 17 | .948 | .942 | .950 | 56 | 64 | 61 | 58 | 70 | 57 | 61.7 | | | | 54 | 62 | 56 | |
| 18 | .956 | .944 | .972 | 59 | 60 | 58 | 57 | 57 | 57 | 57.0 | | | | 56½ | 56 | 53 | |
| 19 | .960 | .960 | .968 | 58 | 63 | 59 | 58 | 63 | 57 | 59.3 | | | | 55 | 60 | 55 | |
| 20 | .947 | .948 | .980 | 59 | 64 | 59 | 59 | 62 | 58 | 59.7 | | | | 57 | 61 | 55 | Thunder at 5h.45 p. m. |
| 21 | .972 | .972 | .972 | 58 | 65 | 60 | 59 | 66 | 56 | 60.3 | | | | 57 | 61 | 55 | |
| 22 | .958 | .962 | .974 | 55 | 64 | 61 | 55 | 65 | 59 | 59.7 | | | | 50½ | 61 | 58 | Temp. at sunrise, 49°. |
| 23 | .944 | .938 | .960 | 58 | 63 | 60 | 59 | 62 | 56 | 59.0 | | | | 57 | 60 | 55 | |
| 24 | .934 | .944 | .956 | 57 | 63 | 60 | 60 | 67 | 58 | 61.7 | | | | 55 | 60½ | 56 | |
| 25 | .964 | .936 | .993 | 59 | 60 | 58 | 59 | 60 | 58 | 59.0 | | | | 57 | 59 | 57 | |
| 26 | .968 | .946 | .960 | 57 | 61 | 59 | 56 | 62 | 56 | 58.0 | | | | 54 | 58 | 55 | |
| 27 | .940 | .939 | .960 | 56 | 63 | 57 | 57 | 64 | 54 | 58.3 | | | | 54 | 60 | 52½ | |
| 28 | .950 | .966 | .974 | 54 | 63 | 58 | 57 | 64 | 56 | 59.0 | | | | 53 | 60 | 54 | |
| 29 | .968 | .954 | .976 | 58 | 65 | 62 | 59 | 67 | 59 | 61.7 | | | | 55 | 60 | 58 | Thunder at 8h.15 p. m. |
| 30 | .962 | .946 | .975 | 60 | 64 | 61 | 59 | 63 | 59 | 60.3 | | | | 57 | 61 | 57½ | Lightning at 6h.15 p. m. |
| tal..... | 118.889 | 118.822 | 119.348 | ..... | ..... | ..... | 1731 | 1938 | 1711 | 1793.4 | ..... | ..... | ..... | 1651½ | 1805½ | 1656 | |
| ean..... | 23.963 | 23.961 | 23.978 | ..... | ..... | ..... | 57.7 | 64.6 | 57.0 | 59.8 | ..... | ..... | ..... | 55.0 | 60.2 | 55.2 | |
| | 23.967 | | | | | | 59.8 | | | | | | | 56.8 | | | |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. | | | | | | | | | | | | | | | | | | | | |
| Nov. 21 | ..... | ..... | 1 | N..... | 3 | ..... | 4 | N..... | 2 | ..... | 2 | N ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | 12.40 p. m. | 12.50 p. m. | 1 | NW..... | 2½ | High... | 6 | NE..... | 2 | High .. | 8 | NE..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | N..... | 3 | Mid. .. | | NE..... | 3 | Mid.... | | | | | | | | | | |
| | 2.50 p. m.. | 4 p. m..... | | | | | | | | | | | | | | | | | | |
| | 4.45 p. m.. | 5.30 p. m.. | | | | | | | | | | | | | | | | | | |
| 23 | 3.5 p. m... | 3.20 p. m.. | 6 | N ..... | 3 | ..... | 8 | N..... | 1 | Mid .... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E.SE.... | 2½ | | | | | | | | | | | |
| 24 | ..... | ..... | 1 | ..... | ..... | ..... | 9 | S . ..... | 2½ | ..... | 8 | S..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 25 | 2.35 p. m.. | 3.30 p. m.. | 2 | S ..... | 2 | High .. | 10 | Stat. &N. | 1 | Mid ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 26 | ..... | ..... | 2 | ..... | ..... | ..... | 10 | S..... | 2 | Mid.... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | | | | | E ..... | 2½ | Low | | | | | | | | | | |
| 27 | ..... | ..... | 9 | N..... | 2 | ..... | 6 | W..... | 1 | High .. | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | N & E... | 1 | Mid ... | | | | | | | | | | |
| 28 | ..... | ..... | 7 | W..... | 2 | High .. | 8 | SE..... | 2 | ..... | 2 | NE ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | ..... | ..... | 0 | ..... | ..... | ..... | 5 | SW ..... | 2½ | High .. | 0 | ..... | ..... | ..... | W .... | 2 | ..... | ..... | W..... | 2 |
| | | | | | | | | S..... | 2 | Mid ... | | | | | | | | | | |
| 30 | ..... | ..... | 7 | S ..... | 2 | ..... | 10 | SE ..... | 2½ | ..... | 9 | S..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total..... | ..... | ..... | 124 | ..... | ..... | ..... | 137 | ..... | ..... | ..... | 107 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean..... | ..... | ..... | 4.1 | ..... | ..... | ..... | 7.9 | ..... | ..... | ..... | 3.6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. Mean. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Nov. 1 | 23.954 | 23.940 | 23.946 | 58 | 64 | 58 | 56½ | 67 | 56 | 59.8 | The same as thermometer in open air. | | | 56 | 61½ | 55 | Temp. at 1 a. m. 51°. |
| 2 | .938 | .922 | .936 | 55 | 63 | 60 | 57 | 62 | 57 | 58.7 | | | | 55 | 60½ | 57 | Temp. at 6½ a. m. 53°. |
| 3 | .920 | .918 | .938 | 58 | 63 | 61 | 58 | 64 | 58 | 60.0 | | | | 57 | 59½ | 57 | Temp. at 6½ a. m. 55°. |
| 4 | .934 | .920 | .954 | 59 | 64 | 59 | 57 | 68 | 57 | 60.7 | | | | 56 | 62 | 56 | |
| 5 | .959 | .936 | .938 | 59 | 64 | 58 | 58 | 65 | 56 | 59.7 | | | | 56 | 60 | 55 | |
| 6 | .926 | .916 | .922 | 57 | 64 | 60 | 57 | 64 | 57 | 59.3 | | | | 55 | 58½ | 57 | |
| 7 | .910 | .914 | .908 | 56 | 64 | 59 | 56 | 66 | 56 | 59.3 | | | | 54 | 60½ | 55 | Temp. at sunrise 51°. |
| 8 | .910 | .902 | .898 | 57 | 64 | 57 | 58 | 64 | 54 | 58.7 | | | | 55 | 61 | 53½ | Thunder at 2h.30 p. m. |
| 9 | .904 | .898 | .938 | 57 | 64 | 60 | 55½ | 66 | 57 | 59.5 | | | | 55 | 59 | 55 | 3h.30 p. m. |
| 10 | .952 | .932 | .946 | 58 | 65 | 59 | 58 | 65 | 57 | 60.0 | | | | 55½ | 61 | 52 | |
| 11 | .916 | .912 | .904 | 58 | 64 | 58 | 60 | 65½ | 54 | 59.8 | | | | 49 | 60 | 53 | |
| 12 | .898 | .876 | .876 | 58 | 65 | 57 | 56 | 64 | 55 | 58.3 | | | | 54 | 59 | 53 | |
| 13 | .878 | .874 | .876 | 57 | 61 | 56 | 57 | 61 | 53 | 57.0 | | | | 54 | 59 | 52 | Thunder at 1h.45 p. m. |
| 14 | .894 | .894 | .920 | 56 | 62 | 58 | 54 | 60 | 56 | 56.7 | | | | 53 | 59 | 55 | |
| 15 | .926 | .934 | .978 | 59 | 62 | 60 | 57 | 64 | 58 | 59.7 | | | | 56 | 59 | 57 | |
| 16 | .952 | .940 | .958 | 58 | 62 | 57 | 58 | 60 | 56 | 58.0 | | | | 56 | 60 | 55 | |
| 17 | .936 | .919 | .916 | 56 | 63 | 59 | 56 | 62 | 57 | 58.3 | | | | 55 | 60 | 57 | |
| 18 | .940 | .934 | .949 | 57 | 62 | 60 | 58 | 62 | 59 | 59.7 | | | | 56 | 61 | 58 | |
| 19 | .972 | .984 | .994 | 59 | 63 | 59 | 56 | 64 | 54 | 58.0 | | | | 56 | 60 | 52 | |
| 20 | 24.002 | 24.016 | 24.008 | 55 | 64 | 56 | 55 | 66 | 52 | 57.7 | | | | 54 | 62 | 50 | |
| 21 | 23.996 | 24.006 | 23.982 | 54 | 62 | 56 | 55 | 62 | 53 | 56.7 | | | | 51½ | 55 | 52 | Temp. at 6h.15 a. m. |
| 22 | .948 | 23.958 | .954 | 54 | 63 | 57 | 54 | 62 | 54 | 56.7 | | | | 50 | 56 | 53 | 53°; N.W. winds. |
| 23 | .940 | .936 | .960 | 56 | 63 | 56 | 55 | 67 | 53 | 58.3 | | | | 53 | 61 | 51 | |
| 24 | .954 | .972 | .995 | 55 | 62 | 60 | 55 | 62 | 59 | 58.7 | | | | 53 | 58½ | 58 | |
| 25 | .976 | .973 | .988 | 57 | 64 | 58 | 56 | 64 | 56 | 58.7 | | | | 54½ | 59 | 53 | Thunder at 3 p. m. |
| 26 | .978 | .978 | .980 | 56 | 65 | 58 | 55 | 62 | 56 | 57.7 | | | | 54 | 61 | 55 | |
| 27 | .946 | .958 | .948 | 54 | 62 | 57 | 53 | 63 | 54 | 56.7 | | | | 49 | 56 | 52½ | |
| 28 | .936 | .945 | .936 | 54 | 63 | 55 | 53 | 66 | 52 | 57.0 | | | | 50 | 59 | 51 | Temp. at sunrise 51°. |
| 29 | .916 | .934 | .954 | 50 | 61 | 55 | 49 | 60 | 53 | 54.0 | | | | 45 | 55 | 50 | Temp. at 6h.25 a. m. |
| 30 | .958 | .958 | .978 | 54 | 60 | 59 | 55 | 60 | 57 | 57.3 | | | | 53 | 58 | 56 | 46°, W. wind. |
| Total..... | 118.179 | 118.099 | 118.410 | ..... | ..... | ..... | 1678 | 1907.5 | 1666 | 1750.7 | ..... | ..... | ..... | 1610.5 | 1781 | 1626 | |
| Mean..... | 23.939 | 23.936 | 23.947 | ..... | ..... | ..... | 55.9 | 63.6 | 55.5 | 58.3 | ..... | ..... | ..... | 53.7 | 59.4 | 54.2 | |
| | 23.941 | | | | | | 58.3 | | | | | | | 55.8 | | | |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A.M. | Barometer. Height. 2 P.M. | Barometer. Height. 9 P.M. | Barometer. Thermometer attached. 7 A.M. | Barometer. Thermometer attached. 2 P.M. | Barometer. Thermometer attached. 9 P.M. | Thermometer in open air. 7 A.M. | Thermometer in open air. 2 P.M. | Thermometer in open air. 9 P.M. | Thermometer in open air. Mean. | Psychrometer. Dry Bulb. 7 A.M. | Psychrometer. Dry Bulb. 2 P.M. | Psychrometer. Dry Bulb. 9 P.M. | Psychrometer. Wet bulb. 7 A.M. | Psychrometer. Wet bulb. 2 P.M. | Psychrometer. Wet bulb. 9 P.M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| October 1 | 23.964 | 23.952 | 23.972 | 59 | 64 | 59 | 58 | 67 | 57 | 60.7 | The same as thermometer in open air. | | | 57 | 63 | 55 | |
| 2 | .960 | .946 | .954 | 58 | 64 | 60 | 59 | 65 | 58 | 60.7 | | | | 55 | 60 | 55 | |
| 3 | .948 | .948 | .978 | 58 | 65 | 61 | 58 | 66 | 57 | 60.3 | | | | 56 | 60 | 56 | |
| 4 | .962 | .956 | .973 | 59 | 65 | 60 | 59 | 66 | 57 | 60.7 | | | | 56 | 63 | 55 | |
| 5 | .972 | .962 | .992 | 59 | 63 | 57 | 58 | 63 | 57 | 59.3 | | | | 57 | 61 | 54 | |
| 6 | 24.002 | .984 | 24.016 | 57 | 63 | 60 | 58 | 64 | 57 | 59.7 | | | | 54½ | 61 | 56 | |
| 7 | 24.006 | .978 | 24.012 | 58 | 62 | 59 | 58 | 67 | 56 | 60.3 | | | | 57 | 62 | 55 | |
| 8 | 24.000 | .996 | 24.015 | 57 | 61 | 58 | 56 | 61 | 56 | 57.7 | | | | 55 | 60 | 55 | |
| 9 | 24.022 | 24.014 | 24.022 | 57 | 64 | 60 | 58 | 64 | 59 | 60.3 | | | | 56 | 60 | 58 | |
| 10 | 23.978 | 23.988 | 23.988 | 55 | 66 | 61 | 59 | 68 | 58 | 61.7 | | | | 53 | 57 | 57 | |
| 11 | .950 | .958 | .944 | 55 | 65 | 57 | 56 | 66 | 56 | 59.3 | | | | 52 | 61 | 48 | Thunder at 4 p. m. |
| 12 | .934 | .943 | .945 | 55 | 64 | 58 | 58 | 64 | 58 | 60.0 | | | | 51½ | 59 | 56 | Temperature at 6A.15, a.m., 51°. |
| 13 | .933 | .932 | .934 | 56 | 65 | 61 | 58 | 67 | 57 | 60.7 | | | | 55 | 61½ | 57 | |
| 14 | .926 | .910 | .922 | 56 | 62 | 56 | 56 | 62 | 55 | 57.7 | | | | 55 | 60½ | 51 | |
| 15 | .916 | .923 | .943 | 57 | 64 | 59 | 59 | 67 | 56 | 60.7 | | | | 53 | 61 | 55 | Thunder at 7 p. m. |
| 16 | .943 | .953 | .972 | 56 | 63 | 60 | 57 | 65 | 57 | 59.7 | | | | 55 | 61 | 56 | |
| 17 | .956 | .938 | .968 | 57 | 62 | 57 | 58 | 60 | 55 | 57.7 | | | | 57 | 59 | 54 | |
| 18 | .930 | .920 | .930 | 56 | 60 | 57 | 56 | 63 | 55 | 58.0 | | | | 55 | 60 | 53 | |
| 19 | .928 | .912 | .946 | 57 | 59 | 58 | 57 | 60 | 56 | 57.7 | | | | 55 | 59 | 55 | |
| 20 | .940 | .912 | .951 | 58 | 59 | 58 | 56 | 58 | 57 | 57.0 | | | | 55 | 58 | 57 | |
| 21 | .943 | .912 | .956 | 57 | 58 | 57 | 56 | 56 | 56 | 56.0 | | | | 56 | 56 | 56 | |
| 22 | .952 | .939 | .962 | 57 | 61 | 57 | 56 | 61 | 55 | 57.3 | | | | 56 | 59 | 53 | |
| 23 | .972 | .972 | .976 | 57 | 64 | 59 | 56 | 66 | 57 | 59.7 | | | | 55 | 56 | 56 | |
| 24 | .959 | .920 | .940 | 56 | 60 | 58 | 57 | 59 | 56 | 57.3 | | | | 51 | 58 | 54½ | Thunder at 3A.30 p. m. |
| 25 | .932 | .916 | .938 | 56 | 61 | 61 | 57 | 64 | 58 | 59.7 | | | | 55 | 60 | 57 | |
| 26 | .931 | .922 | .959 | 57 | 66 | 60 | 59 | 61 | 57 | 60.0 | | | | 57 | 61 | 56½ | |
| 27 | .956 | .952 | .980 | 60 | 64 | 61 | 57 | 66 | 59 | 60.7 | | | | 57 | 61 | 58 | |
| 28 | .983 | .992 | 24.000 | 58 | 63 | 60 | 59 | 65 | 58 | 60.7 | | | | 57 | 61 | 56 | |
| 29 | .980 | .954 | 23.986 | 57 | 64 | 59 | 58 | 66 | 56 | 60.0 | | | | 56 | 61 | 55 | |
| 30 | .966 | .910 | .956 | 59 | 64 | 61 | 61 | 65 | 60 | 62.0 | | | | 59 | 62 | 59 | |
| 31 | .947 | .931 | .952 | 59 | 63 | 59 | 62 | 64 | 55 | 60.3 | | | | 60 | 62 | 54 | |
| Total..... | 122.694 | 122.343 | 122.922 | ..... | ..... | ..... | 1790 | 1979 | 1761 | 1843.6 | ..... | ..... | ..... | 1722 | 1867 | 1713 | |
| Mean..... | 23.938 | 23.947 | 23.907 | ..... | ..... | ..... | 57.7 | 63.8 | 56.8 | 59.47 | ..... | ..... | ..... | 55.5 | 60.2 | 55.3 | |
| | 23.957 | | | | | | 59.43 | | | | | | | 57.0 | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 12.55 p. m.<br>3.35 p. m.. | 2 p. m.....<br>4.40 p. m.. | | | | | | | | | | | | | | | | | | |
| 26 | ..... | ..... | 1 | ..... | ..... | ..... | 8 | S. & E... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 27 | ..... | ..... | 2 | W..... | 1 | Cirr... | 7 | SE..... | 2 | ..... | 8 | N..... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 28 | 8.30 a. m..<br>10.40 a. m.<br>5 p. m..... | 10 a.m.mist<br>4 p m. rain<br>5.30 p. m.. | 8 | N.. ..... | 2½ | ..... | 10 | N. & E.. | 2 | ..... | 9 | N.NE.... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | ..... | ..... | 0 | ..... | ..... | ..... | 4 | NE..... | 2 | ..... | 0 | ..... | ..... | ..... | N.W.. | 2 | ..... | ..... | ..... | ..... |
| 30 | ..... | ..... | 8 | W..... | 2 | H. .... | 8 | W.....<br>NE..... | 1<br>3 | H.....<br>M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 31 | ..... | ..... | 7 | W.....<br>N..... | 1<br>2 | H. ....<br>M.... | 8 | W.....<br>S..... | 2<br>2 | H.....<br>M..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Total... | ..... | ..... | 152 | ..... | ..... | ..... | 269 | ..... | ..... | ..... | 91 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 4.9 | ..... | ..... | ..... | 8.7 | ..... | ..... | ..... | 2.9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| Dec. 1 | 23.982 | 23.984 | 23.988 | 58 | 57 | 55 | 56 | 55 | 55 | 55.3 | | | | 56 | 55 | 53 | |
| 2 | .974 | .984 | 24.016 | 56 | 60 | 59 | 54 | 61 | 57 | 57.3 | | | | 54 | 59 | 55 | |
| 3 | 24.000 | 24.004 | 24.024 | 56 | 64 | 60 | 56 | 64 | 59 | 59.7 | | | | 54 | 60 | 55 | |
| 4 | 24.020 | 24.006 | 24.020 | 57 | 64 | 59 | 58 | 65 | 59 | 60.7 | | | | 54 | 60 | 54 | |
| 5 | 24.023 | 24.010 | 24.021 | 57 | 61 | 59 | 57 | 61 | 57 | 58.3 | | | | 55 | 58 | 56 | |
| 6 | 23.993 | 24.024 | 24.024 | 56 | 65 | 55 | 54 | 63 | 52 | 56.3 | | | | 49 | 56 | 48 | |
| 7 | 24.000 | 23.916 | 23.992 | 54 | 65 | 56 | 53 | 68 | 56 | 59.0 | | | | 50 | 60 | 49 | |
| 8 | 23.982 | .951 | .956 | 58 | 62 | 54 | 59 | 62 | 50 | 57.0 | | | | 54 | 59½ | 45 | |
| 9 | .936 | .939 | .944 | 53 | 63 | 55 | 53 | 63 | 52 | 56.0 | | | | 49 | 58 | 48 | |
| 10 | .940 | .926 | .963 | 55 | 58 | 57 | 55 | 58 | 55 | 56.0 | | | | 53 | 56 | 54 | |
| 11 | .974 | .961 | .988 | 56 | 58 | 58 | 54 | 58 | 57 | 56.3 | | | | 53 | 57 | 56 | |
| 12 | .974 | .974 | .990 | 56 | 60 | 57 | 57 | 59 | 55 | 57.0 | | | | 54 | 59 | 55 | |
| 13 | .980 | .990 | .982 | 56 | 62 | 58 | 57 | 61 | 55 | 57.7 | | | | 54½ | 59 | 54 | |
| 14 | .956 | .941 | .944 | 57 | 60 | 55 | 57 | 62 | 53 | 57.3 | | | | 56 | 59 | 52 | |
| 15 | .948 | .940 | .949 | 54 | 60 | 58 | 54 | 61 | 57 | 57.3 | | | | 51 | 59 | 56 | |
| 16 | .929 | .912 | .948 | 57 | 64 | 59 | 56 | 63 | 55 | 58.0 | | The same as thermometer in open air. | | 54 | 57 | 55 | |
| 17 | .930 | .916 | .930 | 56 | 64 | 57 | 55 | 65 | 54 | 58.0 | | | | 53 | 62 | 51 | |
| 18 | .908 | .914 | .919 | 55 | 63 | 55 | 53 | 63 | 53 | 56.3 | | | | 49 | 59 | 50 | |
| 19 | .916 | .928 | .916 | 54 | 63 | 56 | 52 | 62 | 53 | 55.7 | | | | 51 | 60 | 52 | |
| 20 | .906 | .910 | .905 | 55 | 62 | 55 | 55 | 59 | 52 | 55.3 | | | | 54 | 58 | 45 | Clouds at 5 p. m.; N. 2. |
| 21 | .902 | .910 | .918 | 52 | 62 | 55 | 52 | 65 | 52 | 56.3 | | | | 47 | 59 | 50 | Temp. at sunrise, 49°. |
| 22 | .914 | .906 | .914 | 55 | 59 | 56 | 54 | 58 | 51 | 54.3 | | | | 53 | 57 | 50 | |
| 23 | .910 | .917 | .932 | 53 | 62 | 55 | 53 | 57 | 54 | 54.7 | | | | 51 | 60 | 50 | |
| 24 | .932 | .943 | .934 | 55 | 64 | 58 | 55 | 63 | 56 | 58.0 | | | | 53 | 59 | 55 | |
| 25 | .956 | .956 | .946 | 58 | 59 | 55 | 56 | 57 | 53 | 55.3 | | | | 54 | 57 | 52 | |
| 26 | .938 | .958 | .942 | 54 | 62 | 54 | 55 | 62 | 51 | 56.0 | | | | 50 | 58 | 48 | Temp. at 6.40 a. m., 49°. |
| 27 | .934 | .906 | .970 | 51 | 62 | 55 | 51 | 62 | 54 | 55.7 | | | | 45 | 56 | 53 | Temp. at 6.40 a. m., 48°; |
| 28 | .962 | .964 | .964 | 57 | 62 | 57 | 57 | 61 | 55 | 57.7 | | | | 56 | 60 | 54 | clouds at 5 p. m.; N. 1. |
| 29 | .930 | .924 | .918 | 52 | 65 | 55 | 54 | 65 | 53 | 57.3 | | | | 39 | 58 | 49 | Clouds at 8 p. m.; NE 2. |
| 30 | .900 | .910 | .920 | 54 | 63 | 55 | 55 | 61 | 54 | 56.7 | | | | 42 | 53 | 50 | Temp. at 6.45 a. m., 51°. |
| 31 | .918 | .958 | .970 | 52 | 63 | 56 | 51 | 60 | 53 | 54.7 | | | | 45 | 56 | 52 | Temp. at 6.45 a. m., 48°. |
| Total..... | 122.467 | 122.492 | 122.767 | ..... | ..... | ..... | 1608 | 1904 | 1682 | 1762.2 | ..... | ..... | ..... | 1592.5 | 1803.5 | 1606 | |
| Mean..... | 23.9506 | 23.9514 | 23.960 | ..... | ..... | ..... | 54.8 | 61.4 | 54.3 | 56.8 | ..... | ..... | ..... | 51.4 | 58.2 | 51.8 | |
| | | 23.954 | | | | | | 56.8 | | | | | | | 53.8 | | |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. Mean. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Nov. 1 | 23.954 | 23.940 | 23.946 | 58 | 64 | 58 | 56½ | 67 | 56 | 59.8 | The same as thermometer in open air. | | | 56 | 61½ | 55 | Temp. at 1 a. m. 51°. |
| 2 | .938 | .922 | .936 | 55 | 63 | 60 | 57 | 62 | 57 | 58.7 | | | | 55 | 60½ | 57 | Temp. at 6½ a m. 53°. |
| 3 | .920 | .918 | .938 | 58 | 63 | 61 | 58 | 64 | 58 | 60.0 | | | | 57 | 59½ | 57 | Temp. at 6½ a. m. 55°. |
| 4 | .934 | .920 | .954 | 59 | 64 | 59 | 57 | 68 | 57 | 60.7 | | | | 56 | 62 | 56 | |
| 5 | .959 | .936 | .938 | 59 | 64 | 58 | 58 | 65 | 56 | 59.7 | | | | 56 | 60 | 55 | |
| 6 | .926 | .916 | .922 | 57 | 64 | 60 | 57 | 64 | 57 | 59.3 | | | | 55 | 58½ | 57 | |
| 7 | .910 | .914 | .908 | 56 | 64 | 59 | 56 | 66 | 56 | 59.3 | | | | 54 | 60½ | 55 | Temp. at sunrise 51°. |
| 8 | .910 | .902 | .898 | 57 | 64 | 57 | 58 | 64 | 54 | 58.7 | | | | 55 | 61 | 53½ | Thunder at 2h.30 p. m. |
| 9 | .904 | .898 | .938 | 57 | 64 | 60 | 55½ | 66 | 57 | 59.5 | | | | 55 | 59 | 55 | 3h.30 p. m. |
| 10 | .952 | .932 | .946 | 58 | 65 | 59 | 58 | 65 | 57 | 60.0 | | | | 55½ | 61 | 52 | |
| 11 | .916 | .912 | .904 | 58 | 64 | 58 | 60 | 65½ | 54 | 59.8 | | | | 49 | 60 | 53 | |
| 12 | .898 | .876 | .876 | 58 | 65 | 57 | 56 | 64 | 55 | 58.3 | | | | 54 | 59 | 53 | |
| 13 | .878 | .874 | .876 | 57 | 61 | 56 | 57 | 61 | 53 | 57.0 | | | | 54 | 59 | 52 | Thunder at 1h.45 p. m. |
| 14 | .894 | .894 | .920 | 56 | 62 | 58 | 54 | 60 | 56 | 56.7 | | | | 53 | 59 | 55 | |
| 15 | .926 | .934 | .978 | 59 | 62 | 60 | 57 | 64 | 58 | 59.7 | | | | 56 | 59 | 57 | |
| 16 | .952 | .940 | .958 | 58 | 62 | 57 | 58 | 60 | 56 | 58.0 | | | | 56 | 60 | 55 | |
| 17 | .936 | .919 | .916 | 56 | 63 | 59 | 56 | 62 | 57 | 58.3 | | | | 55 | 60 | 57 | |
| 18 | .940 | .934 | .949 | 57 | 62 | 60 | 58 | 62 | 59 | 59.7 | | | | 56 | 61 | 58 | |
| 19 | .972 | .984 | .994 | 59 | 63 | 59 | 56 | 64 | 54 | 58.0 | | | | 56 | 60 | 52 | |
| 20 | 24.002 | 24.016 | 24.008 | 55 | 64 | 56 | 55 | 66 | 52 | 57.7 | | | | 54 | 62 | 50 | |
| 21 | 23.996 | 24.006 | 23.982 | 54 | 62 | 56 | 55 | 62 | 53 | 56.7 | | | | 51½ | 55 | 52 | Temp. at 6h.15 a. m. 53°; N.W. winds. |
| 22 | .948 | 23.958 | .954 | 54 | 63 | 57 | 54 | 62 | 54 | 56.7 | | | | 50 | 56 | 53 | |
| 23 | .940 | .936 | .960 | 56 | 63 | 56 | 55 | 67 | 53 | 58.3 | | | | 53 | 61 | 51 | |
| 24 | .954 | .972 | .995 | 55 | 62 | 60 | 55 | 62 | 59 | 58.7 | | | | 53 | 58½ | 58 | |
| 25 | .976 | .973 | .988 | 57 | 64 | 58 | 56 | 64 | 56 | 58.7 | | | | 54½ | 59 | 53 | Thunder at 3 p. m. |
| 26 | .978 | .978 | .980 | 56 | 65 | 58 | 55 | 62 | 56 | 57.7 | | | | 54 | 61 | 55 | |
| 27 | .946 | .958 | .948 | 54 | 62 | 57 | 53 | 63 | 54 | 56.7 | | | | 49 | 56 | 52½ | |
| 28 | .936 | .945 | .936 | 54 | 63 | 55 | 53 | 66 | 52 | 57.0 | | | | 50 | 59 | 51 | Temp. at sunrise 51°. |
| 29 | .916 | .934 | .954 | 50 | 61 | 55 | 49 | 60 | 53 | 54.0 | | | | 45 | 55 | 50 | Temp. at 6h.25 a. m. 46°, W. wind. |
| 30 | .958 | .958 | .978 | 54 | 60 | 59 | 55 | 60 | 57 | 57.3 | | | | 53 | 58 | 56 | |
| Total..... | 118.179 | 118.099 | 118.410 | ..... | ..... | ..... | 1678 | 1907.5 | 1666 | 1750.7 | ..... | ..... | ..... | 1610.5 | 1781 | 1626 | |
| Mean..... | 23.939 | 23.936 | 23.947 | ..... | ..... | ..... | 55.9 | 63.6 | 55.5 | 58.3 | ..... | ..... | ..... | 53.7 | 59.4 | 54.2 | |
| | 23.941 | | | | | | 58.3 | | | | | | | 55.8 | | | |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1857. Dec. 1 | 9.15 a. m.. | 1.30 p. m.. | 10 | ..... | ..... | Fog... | 10 | SW..... | 2 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 2 | ..... | ..... | 10 | E..... | 2 | ..... | 7 | SE.. .... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 3 | ..... | ..... | 3 | SE..... | 2 | ..... | 9 | SE..... | 2½ | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 4 | ..... | ..... | 8 | SE..... | 2 | ..... | 9 | NE..... | 1 | H..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | E..... | 3 |
| | | | | | | | | E.SE.... | 2 | L. ..... | | | | | | | | | | |
| 5 | 11.20 a. m. | 1.10 p. m.. | 9 | E..... | 2½ | ..... | 10 | E..... | 2½ | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | E..... | 2 |
| 6 | ..... | ..... | 1 | S..... | 2 | ..... | 4 | NE..... | 2½ | H..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | S..... | 2½ | M..... | | | | | | | | | | |
| 7 | 3.25 p. m.. | 3.40 p. m.. | 1 | N..... | 2 | ..... | 7 | N.NE.... | 2 | M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | SE. below N.NE. | | | | | | | | | | | | |
| 8 | 2.15 p. m.. | 2.25 p. m.. | 4 | E.NE.... | 2½ | ..... | 10 | ..... | ..... | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| | 2.40 p. m.. | 3.10 p. m.. | | | | | | E.. ..... | 2 | L. ..... | | | | | | | | | | |
| 9 | ..... | ..... | 1 | NE..... | 1 | ..... | 8 | NE..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | | | | | E..... | 2 | | | | | | | | | | | |
| 10 | 9.15 a. m.. | 12.30 p. m. | 8 | E..... | 2½ | ..... | 10 | SE..... | 2 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 1.15 p. m.. | 3.10 p. m.. | | | | | | | | | | | | | | | | | | |
| 11 | 1 p. m..... | 1.20 p. m.. | 10 | SE.... .. | 2½ | ..... | 10 | S.SE. .. | 2 | ..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 2.5 p. m... | 2.25 p. m.. | | | | | | | | | | | | | | | | | | |
| 12 | 10.35 a. m. | 12.10 p. m. | 7 | E..... | 2 } | M..... | 10 | E. ..... | 1 | Fog. .... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| | 1.15 p. m.. | 2.40 p. m.. | | S..... | 1 } | | | | | | | | | | | | | | | |
| | 6.55 p. m.. | 7.20 p. m.. | | | | | | | | | | | | | | | | | | |
| 13 | 2.10 p. m.. | 2.20 p. m.. | 4 | W..... | 1 | H..... | 10 | S..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | S..... | 1 | M..... | ..... | E..... | 2 | | | | | | | | | | | |
| 14 | ..... | ..... | 10 | SE..... | 1 | ..... | 9 | SE..... | 1 | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 15 | ..... | ..... | 1 | ..... .. | ..... | ..... | 10 | S.SE .... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S W... | 2 |
| 16 | ..... | ..... | 1 | S..... | 2 | ..... | 8 | S..... | 2 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 17 | ..... | ..... | 7 | W..... | 1 | H..... | 9 | SE..... | 2 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S..... | 2 |
| 18 | ..... | ..... | 1 | ..... | ..... | ..... | 10 | S ..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 19 | 2.25 p. m.. | 3.30 p m.. | 2 | ..... | ..... | ..... | 8 | S.SE.. .. | 2 | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 20 | ..... | ..... | 7 | N..... | 2 | ..... | 10 | NE.. ... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2½ |
| 21 | ..... | ..... | 2 | W..... | 2 | Cirr.. | 8 | SE.&NE. | 2 | M..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | N..... | 2 | M.... | | intermingling. | | | | | | | | | | | | |
| 22 | 12.40 p. m. | 1 p. m..... | 8 | NE. & N.. | 2½ | M..... | 10 | N..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | | | | | E.SE..... | 2½ | | | | | | | | | | | |

*Half-hourly Barometrical Observations, made with a view to find out the amount of Daily Amplitude, and the precise hour at which the maxima and the minima*

The numbers marked thus ( * ) are the maxima and the minima of the day.

| Date. | 9 A. M. | Ther. | 9½ A. M. | Ther. | 10 A. M. | Ther. | 10½ A. M. | Ther. | 11 A. M. | Ther. | 11½ A. M. | Ther. | 12 M. | Ther. | 3 P. M. | Ther. | 3½ P. M. | Ther. | 4 P. M. | Ther. | 4½ P. M. | Ther. | 5 P. M. | Ther. | 5½ P. M. | Ther. | 6 P. M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 36.022 | .... | 36.062 | .... | 36.077 | .. | 36.057 | .. | 36.039 | .. | ..... | .. | ..... | . | 35.575 | .. | 35.539 | .. | 35.517 | .. | 35.506 | .. | 35.513 | .. | ..... | .. | ..... | .. | .581 |
| June 10 | 23.966 | 56 | 23.972 | 58 | 23.978 | 59 | *23.983 | 60 | 23.981 | 61 | ..... | .. | ..... | .. | 23.924 | 62 | 23.918 | 62 | 23.912 | 62 | 23.909 | 62 | *23.908 | 61 | 23 908 | 60 | ..... | .. | .075 |
| 11 | * .920 | 60 | .920 | 61 | .917 | 61 | .917 | 62 | .919 | 62 | 23.916 | 63 | ..... | .. | .898 | 63 | .896 | 62 | .888 | 63 | .884 | 63 | * .880 | 63 | 23.884 | 62 | ..... | .. | .040 |
| 12 | 23 968 | 61 | 23 975 | 61 | 23.980 | 61 | 23.981 | 61 | * .984 | 61 | 23.980 | 61 | ..... | .. | .940 | 62 | .939 | 61 | .936 | 61 | * .934 | 61 | .936 | 61 | ..... | .. | ..... | .. | .050 |
| 13 | *24.005 | 58 | 24.005 | 59 | 24.004 | 59 | 24.003 | 59 | .996 | 59 | ..... | .. | ..... | .. | .948 | 60 | .943 | 60 | .940 | 60 | * .936 | 60 | .940 | 60 | ..... | .. | ..... | .. | .069 |
| 14 | 23.980 | 59 | 23.988 | 60 | *23.990 | 60 | 23.988 | 60 | .988 | 62 | ..... | .. | ..... | .. | .949 | 62 | .942 | 61 | .939 | 60 | * .935 | 60 | .936 | 60 | ..... | .. | ..... | .. | .055 |
| 15 | .962 | 67 | .968 | 58 | .969 | 59 | * .973 | 60 | .970 | 63 | ..... | .. | ..... | .. | .936 | 63 | .930 | 63 | * .924 | 62 | .925 | 61 | .925 | 60 | ..... | .. | ..... | .. | .049 |
| 16 | .970 | 58 | .976 | 59 | .982 | 60 | * .989 | 61 | .988 | 62 | ..... | .. | ..... | .. | .954 | 64 | .953 | 63 | .950 | 62 | .945 | 62 | * .940 | 62 | ..... | .. | ..... | .. | .049 |
| 28 | .976 | 59 | .985 | 59 | * .989 | 59 | .984 | 60 | .983 | 60 | ..... | .. | ..... | .. | * .935 | 60 | * .935 | 60 | .940 | 60 | .944 | 59 | .948 | 59 | ..... | .. | ..... | .. | .054 |
| 29 | .990 | 57 | .993 | 57 | * .995 | 57 | .993 | 58 | .990 | 59 | ..... | .. | ..... | .. | .952 | 58 | .940 | 58 | * .932 | 58 | * .932 | 58 | .933 | 57 | ..... | .. | ..... | .. | .063 |
| 30 | .980 | 58 | .982 | 59 | .984 | 59 | * .985 | 60 | .985 | 61 | ..... | .. | ..... | .. | .937 | 63 | .934 | 63 | .928 | 63 | * .924 | 63 | .925 | 62 | ..... | .. | ..... | .. | .061 |
| Total..... | 75.739 | .... | 75.826 | .. | 75.865 | .. | 75.853 | .. | 75.893 | .. | ..... | .. | ..... | .. | 74.948 | .. | 74.869 | .. | 74.806 | .. | 74.774 | .. | 74.784 | .. | ..... | .. | ..... | .. | 1.146 |
| Mean..... | 23.9663 | .... | 23.9908 | .... | *23.9929 | .. | 23.9923 | .. | 23.9907 | | | | | | 23.9446 | .. | 23.9405 | .. | 23.9372 | .. | *23.9352 | .. | 23.9360 | .. | ..... | .. | ..... | .. | .0603 |

*Register of Meteorological Observations*—Continued.

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Dec. 1 | 23.982 | 23.984 | 23.988 | 58 | 57 | 55 | 56 | 55 | 55 | 55.3 | The same as thermometer in open air. | | | 56 | 55 | 53 | |
| 2 | .974 | .984 | 24.016 | 56 | 60 | 59 | 54 | 61 | 57 | 57.3 | | | | 54 | 59 | 55 | |
| 3 | 24.000 | 24.004 | 24.024 | 56 | 64 | 60 | 56 | 64 | 59 | 59.7 | | | | 54 | 60 | 55 | |
| 4 | 24.020 | 24.006 | 24.020 | 57 | 61 | 59 | 58 | 65 | 59 | 60.7 | | | | 54 | 60 | 54 | |
| 5 | 24.023 | 24.010 | 24.021 | 57 | 61 | 59 | 57 | 61 | 57 | 58.3 | | | | 55 | 58 | 56 | |
| 6 | 23.993 | 24.024 | 24.024 | 56 | 65 | 55 | 54 | 63 | 52 | 56.3 | | | | 49 | 56 | 48 | |
| 7 | 24.000 | 23.996 | 23.992 | 54 | 65 | 56 | 53 | 68 | 56 | 59.0 | | | | 50 | 60 | 49 | |
| 8 | 23.982 | .954 | .956 | 58 | 62 | 54 | 59 | 62 | 50 | 57.0 | | | | 54 | 59½ | 45 | |
| 9 | .936 | .939 | .944 | 53 | 63 | 55 | 53 | 63 | 52 | 56.0 | | | | 49 | 58 | 48 | |
| 10 | .940 | .926 | .963 | 55 | 58 | 57 | 55 | 58 | 55 | 56.0 | | | | 53 | 56 | 54 | |
| 11 | .974 | .961 | .988 | 56 | 58 | 58 | 54 | 58 | 57 | 56.3 | | | | 53 | 57 | 56 | |
| 12 | .974 | .974 | .990 | 56 | 60 | 57 | 57 | 59 | 55 | 57.0 | | | | 54 | 59 | 55 | |
| 13 | .980 | .990 | .982 | 56 | 62 | 58 | 57 | 61 | 55 | 57.7 | | | | 54½ | 59 | 54 | |
| 14 | .956 | .941 | .944 | 57 | 60 | 55 | 57 | 62 | 53 | 57.3 | | | | 56 | 59 | 52 | |
| 15 | .948 | .940 | .949 | 54 | 60 | 58 | 54 | 61 | 57 | 57.3 | | | | 51 | 59 | 56 | |
| 16 | .929 | .912 | .948 | 57 | 64 | 59 | 56 | 63 | 55 | 58.0 | | | | 54 | 57 | 55 | |
| 17 | .930 | .916 | .930 | 56 | 64 | 57 | 55 | 65 | 54 | 58.0 | | | | 53 | 62 | 51 | |
| 18 | .908 | .914 | .919 | 55 | 63 | 55 | 53 | 63 | 53 | 56.3 | | | | 49 | 59 | 50 | |
| 19 | .916 | .928 | .916 | 54 | 63 | 56 | 52 | 62 | 53 | 55.7 | | | | 51 | 60 | 52 | |
| 20 | .906 | .910 | .905 | 55 | 62 | 55 | 55 | 59 | 52 | 55.3 | | | | 54 | 58 | 45 | Clouds at 5 p. m.; N. 2. |
| 21 | .902 | .910 | .918 | 52 | 62 | 55 | 52 | 65 | 52 | 56.3 | | | | 47 | 59 | 50 | Temp. at sunrise, 49°. |
| 22 | .914 | .906 | .914 | 55 | 59 | 56 | 54 | 58 | 51 | 54.3 | | | | 53 | 57 | 50 | |
| 23 | .910 | .917 | .932 | 53 | 62 | 55 | 53 | 57 | 54 | 54.7 | | | | 51 | 60 | 50 | |
| 24 | .932 | .943 | .934 | 55 | 64 | 58 | 55 | 63 | 56 | 58.0 | | | | 53 | 59 | 55 | |
| 25 | .956 | .956 | .946 | 58 | 59 | 55 | 56 | 57 | 53 | 55.3 | | | | 54 | 57 | 52 | |
| 26 | .938 | .958 | .942 | 54 | 62 | 54 | 55 | 62 | 51 | 56.0 | | | | 50 | 58 | 48 | Temp. at 6.40 a. m., 49°. |
| 27 | .934 | .906 | .970 | 51 | 62 | 55 | 51 | 62 | 54 | 55.7 | | | | 45 | 56 | 53 | Temp. at 6.40 a. m., 48°; |
| 28 | .962 | .964 | .964 | 57 | 62 | 57 | 57 | 61 | 55 | 57.7 | | | | 56 | 60 | 54 | clouds at 5 p. m.; N. 1. |
| 29 | .930 | .924 | .918 | 52 | 65 | 55 | 54 | 65 | 53 | 57.3 | | | | 39 | 58 | 49 | Clouds at 8 p. m.; NE 2. |
| 30 | .900 | .910 | .920 | 54 | 63 | 55 | 55 | 61 | 54 | 56.7 | | | | 42 | 53 | 50 | Temp. at 6.45 a. m., 51°. |
| 31 | .918 | .958 | .970 | 52 | 63 | 56 | 51 | 60 | 53 | 54.7 | | | | 45 | 56 | 52 | Temp. at 6.45 a. m., 48°. |
| Total | 122.467 | 122.492 | 122.767 | ..... | ..... | ..... | 1698 | 1904 | 1682 | 1762.2 | ..... | ..... | ..... | 1592.5 | 1803.5 | 1606 | |
| Mean | 23.9506 | 23.9514 | 23.960 | ..... | ..... | ..... | 54.8 | 61.4 | 54.3 | 56.8 | ..... | ..... | ..... | 51.4 | 58.2 | 51.8 | |
| | | 23.954 | | | | | | 56.8 | | | | | | | 53.8 | | |

| Date. | 9 A.M. | Ther. | 9½ A.M. | Ther. | 10 A.M. | Ther. | 10½ A.M. | Ther. | 11 A.M. | Ther. | 11½ A.M. | Ther. | 12 M. | Ther. | 3 P.M. | Ther. | 3½ P.M. | Ther. | 4 P.M. | Ther. | 4½ P.M. | Ther. | 5 P.M. | Ther. | 5½ P.M. | Ther. | 6 P.M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. Aug. 1 | 24.006 | 60 | 24.012 | 60 | 24.012 | 60 | *24.075 | 61 | *24.015 | 61 | 24.014 | 61 | ..... | .. | 23.954 | 63 | 23.945 | 62 | 23.941 | 61 | *23.941 | 61 | 23.944 | 60 | ..... | .. | ..... | .. | .074 |
| 2 | 23.976 | 59 | 23.976 | 59 | 23.983 | 60 | 23.986 | 60 | *23.989 | 61 | *23.989 | 61 | 23.984 | 62 | .942 | 62 | .937 | 63 | .934 | 63 | .928 | 62 | * .928 | 62 | 23.928 | 62 | 23.934 | 61 | .061 |
| 3 | .984 | 61 | .985 | 63 | .988 | 61 | * .993 | 64 | .992 | 64 | .992 | 64 | .986 | 64 | .924 | 62 | .928 | 2 | * .924 | 62 | * .924 | 62 | .924 | 61 | 23.926 | 61 | ..... | .. | .069 |
| 4 | .976 | 61 | .983 | 61 | .990 | 61 | * .993 | 62 | .990 | 61 | ..... | .. | ..... | .. | .930 | 64 | .930 | 64 | * .924 | 64 | .924 | 63 | .928 | 63 | ... | .. | ..... | .. | .069 |
| 5 | .968 | 59 | .972 | 60 | .976 | 59 | * .979 | 59 | .976 | 60 | ..... | .. | ..... | .. | .916 | 61 | .916 | 60 | .910 | 60 | * .908 | 60 | .909 | 60 | 23.920 | 59 | ..... | .. | .071 |
| 6 | .954 | 60 | .965 | 61 | .953 | 61 | .972 | 61 | * .978 | 61 | 23.976 | 61 | ..... | .. | .924 | 62 | .930 | 62 | .916 | 62 | .912 | 62 | * .908 | 62 | 23.914 | 61 | ..... | .. | .070 |
| 7 | .965 | 60 | .976 | 60 | * .982 | 60 | .980 | 60 | .973 | 62 | ..... | .. | ..... | .. | .932 | 60 | .928 | 60 | * .928 | 61 | .930 | 61 | .932 | 61 | ..... | .. | ..... | .. | .054 |
| 8 | 23.993 | 59 | 23.995 | 60 | 23.988 | 60 | 24.001 | 60 | 24.002 | 61 | *24.003 | 61 | 23.998 | 61 | .948 | 62 | .944 | 62 | * .942 | 62 | .945 | 62 | .946 | 62 | ..... | .. | ..... | .. | .061 |
| 9 | 24.020 | 59 | 24.032 | 60 | 24.033 | 60 | * .034 | 60 | .031 | 61 | .028 | 61 | ..... | .. | .993 | 60 | .986 | 60 | .984 | 60 | .982 | 59 | * .980 | 59 | 23.980 | 58 | 23.984 | 58 | .054 |
| 10 | .020 | 59 | .022 | 59 | .026 | 60 | .032 | 61 | * .033 | 61 | *24.033 | 61 | 24.032 | 61 | .992 | 62 | .984 | 62 | .980 | 62 | .980 | 60 | .964 | 60 | * .962 | 60 | .966 | 60 | .071 |
| 11 | .016 | 59 | .020 | 59 | .025 | 60 | * .026 | 61 | * .026 | 61 | .024 | 62 | 24.021 | 62 | .987 | 63 | .980 | 63 | .974 | 63 | .973 | 62 | * .970 | 61 | *23.970 | 61 | 23.972 | 60 | .056 |
| 12 | .038 | 60 | .046 | 61 | .052 | 62 | * .055 | 63 | * .055 | 63 | 24.048 | 63 | ..... | .. | .974 | 65 | .974 | 65 | * .968 | 64 | .968 | 63 | .972 | 62 | ..... | .. | ..... | .. | .087 |
| 13 | .023 | 59 | .026 | 60 | .030 | 60 | * .034 | 60 | .030 | 60 | ..... | .. | ..... | .. | .974 | 60 | .966 | 60 | * .960 | 61 | .966 | 61 | .968 | 60 | ..... | .. | ..... | .. | .074 |
| 14 | .030 | 59 | .030 | 60 | * .031 | 60 | * .031 | 60 | .028 | 60 | ..... | .. | ..... | .. | .971 | 58 | .962 | 59 | .960 | 59 | * .960 | 59 | .960 | 59 | 23.963 | 59 | ..... | .. | .071 |
| 15 | 23.990 | 59 | 23.990 | 59 | 23.990 | 59 | *23.991 | 59 | 23.988 | 59 | ..... | .. | ..... | .. | .928 | 60 | .924 | 61 | .924 | 61 | * .923 | 61 | .924 | 61 | ..... | .. | ..... | .. | .068 |
| 16† | 23.994 | 58 | 23.996 | 58 | 23.998 | 58 | *24.000 | 58 | *24.005 | 58 | 23.996 | 58 | ..... | .. | .950 | 59 | .945 | 59 | * .943 | 58 | .944 | 58 | .944 | 58 | 23.944 | 58 | 23.944 | 58 | .062 |
| 17 | 24.036 | 57 | 24.044 | 57 | 24.046 | 57 | *24.048 | 58 | 24.043 | 58 | ..... | .. | ..... | .. | .984 | 59 | .980 | 59 | .970 | 59 | .968 | 59 | * .968 | 59 | .968 | 59 | .978 | 59 | .080 |
| 18 | 24.022 | 59 | 24.027 | 60 | *24.030 | 60 | *24.030 | 60 | 24.030 | 61 | 24.025 | 61 | ..... | .. | .980 | 63 | .972 | 63 | .961 | 63 | .959 | 62 | * .959 | 62 | 23.959 | 62 | 23.964 | 62 | .071 |
| 19 | 23.970 | 59 | *23.974 | 59 | 23.967 | 59 | 23.961 | 59 | 23.956 | 60 | ..... | .. | ..... | .. | .892 | 59 | .888 | 58 | * .888 | 58 | .888 | 58 | .890 | 58 | ..... | .. | ..... | .. | .066 |
| 20 | 23.996 | 57 | 23.997 | 58 | .997 | 58 | 24.000 | 57 | *24.003 | 57 | 24.001 | 57 | ..... | .. | .962 | 57 | .958 | 58 | .956 | 58 | .953 | 58 | * .952 | 58 | 23.954 | 58 | ..... | .. | .051 |
| 25 | 24.085 | 60 | 24.086 | 60 | .089 | 61 | * .090 | 61 | * .090 | 61 | .090 | 62 | 24.084 | 62 | 24.040 | 63 | 24.033 | 63 | 24.028 | 63 | *24.024 | 63 | 24.025 | 63 | 24.025 | 62 | 24.025 | 62 | .066 |
| 26 | .062 | 59 | .066 | 60 | * .067 | 60 | .067 | 61 | .066 | 62 | 24.064 | 63 | ..... | .. | 23.996 | 62 | 23.992 | 62 | 23.988 | 62 | 23.983 | 62 | *23.982 | 62 | 23.986 | 62 | ..... | .. | .085 |
| 27 | .046 | 60 | * .052 | 61 | * .052 | 61 | .049 | 60 | .046 | 60 | ..... | .. | ..... | .. | .989 | 63 | .989 | 62 | .984 | 62 | * .980 | 62 | .986 | 62 | ..... | .. | ..... | .. | .072 |
| 28 | .059 | 62 | .059 | 60 | .059 | 60 | * .064 | 61 | .061 | 62 | ..... | .. | ..... | .. | 23.994 | 63 | .988 | 63 | .986 | 63 | * .985 | 63 | * .985 | 63 | 23.985 | 63 | 23.988 | 62 | .079 |
| 29 | * .056 | 59 | .055 | 60 | .054 | 60 | .054 | 61 | .052 | 61 | 24.050 | 61 | ..... | .. | 24.000 | 61 | 23.999 | 62 | .996 | 62 | * .992 | 62 | .995 | 61 | ..... | .. | ..... | .. | .064 |
| 30 | .053 | 60 | * .069 | 61 | .068 | 61 | .067 | 61 | .067 | 61 | .064 | 62 | ..... | .. | 24.010 | 65 | 24.004 | 65 | .996 | 64 | * .993 | 64 | .994 | 64 | ..... | .. | ..... | .. | .076 |
| 31 | .016 | 60 | .019 | 61 | *24.021 | 62 | .019 | 63 | .018 | 63 | .014 | 64 | ..... | .. | 23.950 | 62 | 23.944 | 62 | 23.942 | 61 | *23.935 | 62 | 23.935 | 62 | 23.936 | 62 | 23.944 | 61 | .066 |
| Total .... | 106.357 | .... | 108.474 | .... | 108.532 | .. | 108.574 | .. | 108.543 | .. | ..... | .. | ..... | .. | 107.036 | .. | 106.916 | .. | 106.801 | .. | 106.768 | .. | 106.772 | .. | ..... | .. | ..... | .. | 1.8 8 |
| Mean .. . | 24.0132 | .... | 24.0176 | .... | 24.0197 | .. | *24.0213 | .. | 24.0201 | .. | ..... | .. | ..... | .. | 23.9643 | .. | 23.9600 | .. | 23.9558 | .. | *23.9544 | .. | 23.9545 | .. | ..... | .. | ..... | .. | .0699 |

† 6½ p. m., 23.952; ther. 58.

*Course of the Clouds at Colonia Tovar.*

| Month. | E. | E.SE. | SE. | S.SE. | S. | S.SW. | SW. | W.SW. | W. | W.NW. | NW. | N.NW. | N. | N.NE. | NE. | E.NE. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | |
| June | 1 | ... | ... | ... | ... | 1 | ... | ... | 1 | ... | ... | ... | ... | ... | ... | ... | High. |
| | 4 | 10 | 18 | 6 | 14 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 1 | 1 | Middle. |
| | 14 | 5 | 1 | ... | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | Low. |
| July | ... | ... | 1 | ... | 2 | 1 | ... | ... | 4 | ... | ... | ... | ... | 1 | ... | ... | High |
| | 5 | 2 | 7 | 7 | 8 | 2 | 1 | ... | ... | ... | ... | ... | 1 | ... | ... | 2 | Middle. |
| | 11 | 12 | 6 | 5 | 6 | ... | ... | ... | ... | ... | ... | ... | 1 | ... | 1 | ... | Low. |
| August | ... | ... | ... | 1 | 1 | ... | 1 | ... | 1 | ... | ... | ... | 1 | ... | 4 | 1 | High. |
| | 11 | 8 | 12 | 6 | 8 | 1 | 2 | ... | ... | ... | ... | ... | 1 | ... | 6 | ... | Middle. |
| | 14 | 2 | 2 | 1 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | Low. |
| September | ... | ... | ... | 1 | ... | ... | ... | 1 | 5 | ... | ... | ... | 2 | ... | ... | 1 | High. |
| | 1 | 3 | 19 | 7 | 14 | ... | ... | ... | ... | ... | ... | ... | 2 | ... | 2 | 2 | Middle. |
| | 5 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | Low. |
| October | ... | 1 | ... | ... | ... | ... | 1 | ... | 1 | ... | ... | ... | 2 | ... | 1 | ... | High. |
| | ... | 6 | 17 | 5 | 25 | ... | 1 | ... | ... | ... | ... | ... | 2 | ... | ... | ... | Middle. |
| | 12 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | Low. |
| November | ... | ... | ... | ... | 1 | ... | 1 | 1 | 8 | ... | 2 | ... | 1 | ... | 1 | 1 | High. |
| | 2 | 1 | 12 | 2 | 18 | ... | 2 | ... | 1 | ... | 1 | ... | 11 | ... | 4 | 1 | Middle. |
| | 7 | 1 | ... | ... | ... | ... | ... | ... | ... | ... | 1 | ... | ... | ... | ... | ... | Low. |
| December | ... | ... | ... | ... | ... | ... | ... | ... | 8 | ... | ... | ... | ... | ... | 2 | ... | High. |
| | 11 | ... | 13 | 3 | 10 | ... | 1 | ... | ... | ... | ... | ... | 12 | 2 | 7 | 3 | Middle. |
| | 3 | 2 | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | Low. |
| Total | 1 | 1 | 1 | 2 | 4 | 2 | 3 | 2 | 28 | ... | 2 | ... | 6 | 1 | 8 | 3 | High. |
| | 34 | 30 | 98 | 36 | 97 | 3 | 7 | ... | 1 | ... | 1 | ... | 30 | 2 | 20 | 9 | Middle. |
| | 66 | 22 | 9 | 6 | 8 | ... | ... | ... | ... | ... | 1 | ... | 2 | ... | 2 | ... | Low. |
| | 101 | 53 | 108 | 44 | 109 | 5 | 10 | 2 | 29 | ... | 4 | ... | 38 | 3 | 30 | 12 | |
| | 415 | | | | | | | | | | | | | | | | |

| Date. | 9 A. M. | Ther. | 9½ A. M. | Ther. | 10 A. M. | Ther. | 10½ A. M. | Ther. | 11 A. M. | Ther. | 11½ A. M. | Ther. | 12 M. | Ther. | 3 P. M. | Ther. | 3½ P. M. | Ther. | 4 P. M. | Ther. | 4½ P. M. | Ther. | 5 P. M. | Ther. | 5½ P. M. | Ther. | 6 P. M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Oct. 2 | 23.994 | 61 | 24.000 | 62 | 24.002 | 62 | *24.005 | 63 | 24.002 | 64 | ..... | .. | ..... | .. | 23.932 | 65 | 23.925 | 63 | 23.925 | 65 | 23.924 | 65 | *23.924 | 64 | 23.926 | 64 | ..... | .. | .081 |
| 3 | 23.985 | 62 | 23.992 | 63 | *23.997 | 64 | 23.997 | 65 | 23.992 | 65 | ..... | .. | ..... | .. | .926 | 65 | .924 | 63 | * .918 | 64 | .920 | 64 | .920 | 64 | ..... | .. | ..... | .. | .079 |
| 4 | 24.006 | 63 | 24.016 | 64 | *24.026 | 65 | *24.026 | 65 | 24.022 | 65 | ..... | .. | ..... | .. | .934 | 64 | .932 | 64 | * .929 | 64 | .931 | 64 | .933 | 64 | ..... | .. | ..... | .. | .097 |
| 5 | .005 | 60 | .015 | 61 | * .022 | 62 | * .024 | 62 | .022 | 62 | ..... | .. | ..... | .. | * .948 | 62 | .959 | 61 | .958 | 61 | .926 | 61 | .955 | 60 | 23.955 | 60 | 23.956 | 60 | .076 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | † .960 | 60 | |
| 6 | .024 | 60 | .032 | 61 | * .033 | 61 | .033 | 62 | .033 | 62 | 24.030 | 63 | ..... | .. | .966 | 64 | .961 | 63 | .958 | 63 | * .958 | 63 | .957 | 63 | *23.957 | 63 | 23.962 | 61 | .076 |
| 7 | .030 | 63 | .037 | 63 | * .037 | 59 | .036 | 59 | .028 | 60 | ..... | .. | ..... | .. | .970 | 62 | .960 | 61 | * .960 | 61 | .960 | 61 | .965 | 60 | ..... | .. | ..... | .. | .077 |
| 8 | .032 | 57 | * .038 | 58 | * .038 | 58 | .036 | 59 | .034 | 59 | 24.030 | 59 | ..... | .. | 23.976 | 61 | .968 | 61 | * .965 | 61 | .970 | 61 | .968 | 61 | ..... | .. | ..... | .. | .073 |
| 9 | .056 | 61 | .060 | 61 | .061 | 61 | * .066 | 62 | .062 | 63 | ..... | .. | ..... | .. | 24.000 | 63 | .996 | 63 | .996 | 63 | .996 | 63 | .994 | 63 | *23.998 | 62 | 23.996 | 62 | .073 |
| 10 | .033 | 61 | .036 | 61 | * .040 | 62 | .036 | 63 | .032 | 63 | ..... | .. | ..... | .. | 23.964 | 65 | .964 | 63 | 962 | 65 | .960 | 63 | .958 | 64 | .958 | 63 | * .957 | 62 | .063 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | †23.960 | 62 | |
| 11 | 23.996 | 61 | 24.000 | 62 | 24.009 | 64 | *24.010 | 65 | 24.004 | 65 | ..... | .. | ..... | .. | .940 | 64 | * .936 | 64 | * .936 | 63 | .939 | 63 | .938 | 63 | .938 | 62 | ..... | .. | .074 |
| 12 | .975 | 60 | 23.980 | 61 | 23.986 | 62 | *23.987 | 62 | 23.982 | 64 | ..... | .. | ..... | .. | .930 | 65 | .928 | 6 | .921 | 64 | .920 | 64 | * .918 | 63 | .920 | 62 | ..... | .. | .069 |
| 13 | .975 | 61 | .986 | 62 | * .990 | 63 | .988 | 64 | .984 | 64 | ..... | .. | ..... | .. | .905 | 64 | .900 | 63 | .897 | 63 | .897 | 63 | * .895 | 63 | * .895 | 63 | 23.898 | 63 | .095 |
| 14 | .968 | 60 | .972 | 62 | .976 | 63 | * .978 | 63 | .976 | 65 | ..... | .. | ..... | .. | .900 | 63 | .895 | 63 | .893 | 63 | .892 | 6 | * .890 | 65 | .892 | 62 | .892 | 61 | .088 |
| 15 | .951 | 60 | 23.963 | 61 | 23.963 | 61 | *23.966 | 63 | .962 | 64 | ..... | .. | ..... | .. | .904 | 64 | .893 | 64 | .890 | 64 | .889 | 63 | .884 | 65 | *23.882 | 62 | 23.884 | 61 | .084 |
| 16 | .993 | 60 | 24.002 | 60 | *24.004 | 61 | *24.004 | 61 | .997 | 63 | ..... | .. | ..... | .. | .924 | 62 | .921 | 63 | * .918 | 62 | .920 | 63 | .920 | 62 | ..... | .. | ..... | .. | .086 |
| 18 | .976 | 58 | 23.978 | 58 | *23.982 | 58 | 23.978 | 58 | .970 | 59 | ..... | .. | ..... | .. | .904 | 59 | .896 | 58 | * .896 | 58 | * .896 | 58 | .896 | 58 | 23.902 | 57 | ..... | .. | .086 |
| 19 | .966 | 58 | .974 | 59 | * .981 | 59 | .976 | 59 | .972 | 59 | ..... | .. | ..... | .. | .898 | 60 | * .896 | 58 | * .896 | 59 | .897 | 59 | .897 | 59 | 23.898 | 59 | ..... | .. | .085 |
| 20 | .972 | 58 | .980 | 59 | * .984 | 59 | .980 | 59 | .975 | 60 | ..... | .. | ..... | .. | .904 | 59 | .898 | 59 | .896 | 60 | * .895 | 60 | .900 | 59 | ..... | .. | ..... | .. | .089 |
| 21 | .954 | 57 | .968 | 57 | * .972 | 57 | .969 | 58 | .960 | 58 | ..... | .. | ..... | .. | .908 | 57 | .900 | 57 | * .898 | 57 | * .898 | 57 | .900 | 57 | ..... | .. | ..... | .. | .074 |
| 22 | .980 | 57 | .989 | 57 | * .994 | 57 | * .994 | 57 | .992 | 59 | ..... | .. | ..... | .. | 932 | 59 | .931 | 59 | * .930 | 59 | .932 | 58 | .936 | 59 | ..... | .. | ..... | .. | .064 |
| 23 | 24.014 | 58 | 24.018 | 59 | *24.026 | 61 | 24.024 | 61 | 24.021 | 61 | ..... | .. | ..... | .. | .954 | 64 | .950 | 64 | .948 | 62 | .946 | 62 | .944 | 62 | *23.943 | 62 | *23.943 | 61 | .083 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | †23.944 | 61 | |
| 24 | 23.991 | 61 | 23.996 | 64 | *24.002 | 64 | 23.998 | 64 | 23.996 | 65 | ..... | .. | ..... | .. | .922 | 61 | .928 | 61 | .929 | 60 | .920 | 60 | * .918 | 58 | 23.920 | 59 | ..... | .. | .084 |
| 25 | .970 | 60 | .976 | 60 | 23.980 | 61 | .981 | 62 | .974 | 63 | ..... | .. | ..... | .. | .904 | 63 | .901 | 63 | .901 | 62 | * .900 | 62 | .901 | 62 | ..... | .. | ..... | .. | .081 |
| 26 | .976 | 60 | 23.982 | 61 | 23.984 | 62 | 23.982 | 62 | .978 | 63 | ..... | .. | ..... | .. | .905 | 64 | .904 | 64 | .904 | 63 | * .903 | 63 | .906 | 62 | ..... | .. | ..... | .. | .081 |
| 27 | 23.997 | 60 | 24.004 | 61 | *24.010 | 61 | 24.008 | 61 | 24.006 | 62 | ..... | .. | ..... | .. | .932 | 64 | .928 | 64 | * .924 | 62 | * .924 | 62 | .925 | 62 | ..... | .. | ..... | .. | .086 |
| 28 | 24.024 | 61 | * .030 | 61 | .028 | 62 | .026 | 63 | .020 | 63 | ..... | .. | ..... | .. | * .936 | 62 | * .936 | 62 | .940 | 62 | .944 | 62 | .947 | 61 | ..... | .. | ..... | .. | .094 |
| 29 | 24.016 | 62 | .020 | 62 | *24.022 | 63 | 24.020 | 63 | 24.014 | 63 | ..... | .. | ..... | .. | .942 | 65 | * .934 | 64 | .938 | 64 | .938 | 64 | * .934 | 63 | 23.936 | 62 | ..... | .. | .088 |
| 30 | 23.998 | 60 | *24.002 | 60 | 24.999 | 61 | 23.997 | 63 | 23.992 | 63 | ..... | .. | ..... | .. | .916 | 65 | .910 | 65 | * .906 | 64 | * .906 | 64 | .908 | 63 | ..... | .. | ..... | .. | .096 |
| 31 | 23.984 | 61 | 23.990 | 62 | *23.992 | 62 | 23.990 | 64 | 23.985 | 64 | ..... | .. | ..... | .. | .924 | 63 | .920 | 63 | .916 | 63 | .912 | 63 | * .902 | 62 | * .902 | 62 | .906 | 62 | .090 |
| Total..... | 115.854 | .... | 116.036 | .... | 116.140 | .. | 116.115 | .. | 115.987 | .. | ..... | .. | ..... | .. | 114.000 | .. | 113.894 | .. | 113.841 | .. | 113.811 | .. | 113.833 | .. | ..... | .. | ..... | .. | 2.392 |
| Mean ..... | 23.995 | .... | 24.001 | .... | *24.005 | .. | 24.004 | .. | 23.9995 | .. | ..... | .. | ..... | .. | 23.931 | .. | 23.927 | .. | 23.9256 | .. | *23.9245 | .. | 23.9251 | .. | ..... | .. | ..... | .. | .0825 |

† 6½ p. m.

No. 6.—*Half-hourly Barometrical Observations*—Continued.

| Date. | 9 A. M. | Ther. | 9½ A. M. | Ther. | 10 A. M. | Ther. | 10½ A. M. | Ther. | 11 A. M. | Ther. | 11½ A. M. | Ther. | 12 M. | Ther. | 3 P. M. | Ther. | 3½ P. M. | Ther. | 4 P. M. | Ther. | 4½ P. M. | Ther. | 5 P. M. | Ther. | 5½ P. M. | Ther. | 6 P. M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Nov. 1 | 23.979 | 59 | 23.986 | 59 | *23.993 | 59 | 23.990 | 60 | 23.989 | 60 | ..... | .. | ..... | .. | 23.916 | 64 | 23.911 | 64 | 23.910 | 64 | 23.906 | 63 | *23.905 | 62 | 23.908 | 62 | ..... | .. | .088 |
| 2 | .980 | 60 | * .986 | 61 | .986 | 62 | .980 | 62 | .976 | 62 | ..... | .. | ..... | .. | .904 | 62 | .896 | 62 | * .892 | 62 | .883 | 62 | .894 | 62 | ..... | .. | ..... | .. | .094 |
| 3 | .972 | 59 | .968 | 60 | * .973 | 61 | .970 | 62 | .966 | 62 | ..... | .. | ..... | .. | .900 | 63 | * .897 | 63 | .897 | 62 | .898 | 62 | .898 | 62 | 23.898 | 61 | ..... | .. | .076 |
| 4 | .965 | 60 | .972 | 60 | * .976 | 61 | .976 | 62 | .974 | 62 | 23.968 | 63 | ..... | .. | .904 | 64 | * .901 | 63 | .901 | 62 | .902 | 62 | .908 | 62 | ..... | .. | ..... | .. | .075 |
| 5 | .986 | 59 | .992 | 60 | * .993 | 61 | .992 | 61 | .986 | 63 | ..... | .. | ..... | .. | .923 | 64 | .923 | 64 | .922 | 63 | .930 | 62 | * .918 | 62 | 23.919 | 62 | 23.920 | 62 | .075 |
| 6 | .959 | 59 | .965 | 60 | * .974 | 63 | .971 | 63 | .968 | 63 | ..... | .. | ..... | .. | .898 | 64 | .895 | 64 | .893 | 64 | .893 | 64 | * .892 | 63 | * .892 | 62 | ..... | .. | .069 |
| 7 | .944 | 62 | .952 | 62 | * .954 | 62 | .954 | 63 | .952 | 64 | ..... | .. | ..... | .. | .898 | 64 | .898 | 64 | .892 | 63 | .892 | 63 | .892 | 62 | .890 | 61 | *23.888 | 60 | .066 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | † .890 | 60 | |
| 8 | .942 | 61 | .948 | 62 | .953 | 63 | .956 | 65 | * .958 | 65 | 23.948 | 64 | ..... | .. | .890 | 63 | .885 | 63 | .892 | 63 | .892 | 61 | .886 | 61 | * .884 | 61 | 23.886 | 60 | .074 |
| 9 | .936 | 60 | .940 | 61 | * .943 | 61 | .940 | 62 | .934 | 63 | ..... | .. | ..... | .. | .884 | 64 | .878 | 64 | * .874 | 64 | .876 | 64 | .877 | 63 | 23.880 | 62 | ..... | .. | .069 |
| 10 | .988 | 62 | .988 | 63 | .994 | 65 | * .997 | 65 | .994 | 65 | 28.988 | 65 | ..... | .. | .924 | 64 | .915 | 63 | * .915 | 64 | .917 | 63 | .920 | 63 | ..... | .. | ..... | .. | .082 |
| 11 | .948 | 60 | .956 | 61 | .958 | 62 | * .960 | 63 | .960 | 64 | .958 | 64 | ..... | .. | .899 | 64 | .895 | 64 | .892 | 64 | .896 | 62 | .894 | 61 | 23.889 | 61 | 23.887 | 60 | .073 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | †23.888 | 59 | |
| 12 | .930 | 60 | * .934 | 61 | * .934 | 61 | .930 | 63 | .929 | 63 | 23.920 | 64 | ..... | .. | .892 | 65 | .860 | 64 | * .852 | 64 | .856 | 63 | .856 | 62 | 23.857 | 61 | ..... | .. | .092 |
| 13 | .916 | 60 | .920 | 61 | .928 | 63 | * .934 | 61 | .930 | 64 | ..... | .. | ..... | .. | .858 | 63 | .852 | 63 | .852 | 62 | * .850 | 62 | .852 | 62 | ..... | .. | ..... | .. | .084 |
| 14 | .948 | 61 | .952 | 62 | * .956 | 62 | .949 | 63 | .947 | 63 | ..... | .. | ..... | .. | .880 | 63 | .868 | 62 | * .864 | 62 | .864 | 61 | .868 | 61 | ..... | .. | ..... | .. | .092 |
| 15 | .989 | 60 | .992 | 61 | * .986 | 61 | 23.984 | 61 | .983 | 61 | ..... | .. | ..... | .. | .918 | 62 | .912 | 62 | * .911 | 62 | .912 | 62 | .916 | 62 | ..... | .. | ..... | .. | .075 |
| 16 | .988 | 58 | .994 | 59 | .999 | 60 | *24.000 | 61 | .997 | 61 | ..... | .. | ..... | .. | .922 | 62 | .918 | 6 | * .914 | 62 | .920 | 62 | .922 | 62 | ..... | .. | ..... | .. | .086 |
| 17 | .980 | 58 | * .983 | 59 | .982 | 60 | 23.982 | 61 | .974 | 61 | ..... | .. | ..... | .. | .904 | 62 | .899 | 62 | * .898 | 62 | * .898 | 62 | .900 | 61 | ..... | .. | ..... | .. | .085 |
| 18 | .984 | 58 | .986 | 59 | * .995 | 61 | *23.995 | 61 | .992 | 31 | ..... | .. | ..... | .. | .923 | 63 | .922 | 63 | .917 | 63 | * .916 | 62 | .919 | 61 | ..... | .. | ..... | .. | .079 |
| 19 | 24.006 | 58 | 24.013 | 58 | 24.019 | 59 | *24.021 | 59 | 24.020 | 59 | 24.018 | 60 | ..... | .. | 23.976 | 63 | 23.966 | 63 | .964 | 63 | .959 | 63 | * .957 | 62 | 23.959 | 62 | ..... | .. | .064 |
| 20 | .047 | 60 | .052 | 61 | * .058 | 60 | .058 | 61 | .053 | 61 | ..... | .. | ..... | .. | 24.006 | 64 | 24.002 | 63 | .997 | 62 | .997 | 62 | .996 | 61 | * .994 | 60 | 23.996 | 60 | .064 |
| 21 | 24 049 | 59 | .050 | 59 | .052 | 60 | .054 | 61 | * .055 | 61 | 24.050 | 61 | ..... | .. | 23.984 | 63 | 23.980 | 63 | .978 | 63 | .976 | 62 | .972 | 61 | .970 | 59 | * .960 | 58 | .095 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | †23.962 | 58 | |
| 22 | 23.985 | 57 | 24.000 | 59 | 24.010 | 61 | 24.010 | 61 | *24.011 | 61 | 24.006 | 61 | ..... | .. | .942 | 62 | .939 | 62 | .934 | 60 | .933 | 60 | * .932 | 59 | .935 | 59 | ..... | .. | .079 |
| 23 | 23.986 | 60 | 23.988 | 60 | *23.991 | 60 | 23.991 | 61 | 23 991 | 61 | 23.984 | 61 | ..... | .. | .924 | 63 | * .922 | 62 | .923 | 61 | .924 | 61 | * .922 | 61 | 23.924 | 61 | ..... | .. | .069 |
| 24 | 24.005 | 59 | 24.010 | 60 | *24.014 | 60 | 24.014 | 61 | 21.014 | 61 | 24.011 | 61 | ..... | .. | .966 | 63 | .958 | 62 | .955 | 62 | * .950 | 6 | .952 | 6 | ..... | .. | ..... | .. | .064 |
| 25 | .014 | 61 | .014 | 61 | .012 | 61 | .012 | 63 | * .018 | 65 | 24.015 | 65 | 24.010 | 65 | .964 | 63 | .954 | 63 | * .943 | 63 | .946 | 63 | .944 | 62 | 23.948 | 61 | ..... | .. | .075 |
| 26 | 24.012 | 60 | 24.018 | 60 | 24.021 | 61 | *24.026 | 62 | .020 | 61 | ..... | .. | ..... | .. | .956 | 65 | .954 | 64 | .954 | 64 | * .953 | 63 | .954 | 63 | .956 | 63 | ..... | .. | .073 |
| 27 | 23.993 | 56 | 23.997 | 57 | 23.999 | 57 | 23.999 | 58 | *24 000 | 58 | 23.995 | 58 | ..... | .. | .939 | 62 | .934 | 62 | .9 0 | 61 | * .930 | 61 | .930 | 6 | .932 | 61 | 23.934 | 60 | .070 |
| 28 | .974 | 57 | .980 | 59 | .984 | 58 | * .990 | 60 | 24.988 | 61 | ..... | .. | ..... | .. | .932 | 63 | .925 | 63 | .924 | 62 | .922 | 61 | .922 | 59 | *23.918 | 59 | 23.920 | 58 | .072 |
| 29 | 23.970 | 57 | 23.970 | 57 | 23.974 | 58 | *23.978 | 59 | 23.974 | 59 | ..... | .. | ..... | .. | .920 | 61 | .912 | 6 | * .910 | 61 | .912 | 61 | .914 | 60 | ..... | .. | ..... | .. | .068 |
| 30 | 24.002 | 56 | 24.002 | 56 | *24.004 | 57 | *24.004 | 37 | 24.000 | 57 | ..... | .. | ..... | .. | .946 | 61 | .938 | 61 | .936 | 60 | .932 | 60 | * .930 | 60 | 23.936 | 60 | ..... | .. | .074 |
| Total..... | 119.358 | .... | 119.498 | .... | 119.615 | .. | 119.617 | .. | 119.553 | .. | ..... | .. | ..... | .. | 117.662 | .. | 117.512 | .. | 117.486 | .. | 117.435 | .. | 117.442 | .. | ..... | .. | ..... | .. | 2.304 |
| Mean ..... | 23.978 | .... | 23.983 | ... | *23.9872 | . | *23.9872 | .. | 23.985 | .. | ..... | . | ..... | .. | 23.932 | .. | 23.917 | .. | *23.9145 | .. | *23.9145 | .. | 23.9147 | .. | ..... | .. | ..... | .. | .0768 |

† 6½ p. m.

| | | The | | The | | The | | The | | The | | The | | The | | The | | The | | The | | The | | The | | The | | The | tude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dec. 4 | 24.054 | 60 | *24.056 | 61 | *24.056 | 61 | 24.056 | 62 | 24.054 | 65 | ..... | .. | ..... | .. | 23 990 | 64 | 23.983 | 63 | 23.980 | 63 | *23 974 | 63 | 23.980 | 63 | ..... | .. | ..... | .. | .082 |
| 5 | .064 | 61 | .068 | 61 | .067 | 62 | *.069 | 63 | .062 | 63 | ..... | .. | ..... | .. | 23 990 | 60 | 23.990 | 61 | 23 986 | 61 | *23 982 | 61 | 23.984 | 61 | ..... | .. | ..... | .. | .087 |
| 6 | .058 | 59 | 065 | 60 | *.069 | 62 | *.069 | 62 | .066 | 63 | ..... | .. | ..... | .. | *24.006 | 63 | 24.006 | 62 | 24 006 | 62 | 24.008 | 61 | 24.009 | 60 | ..... | .. | ..... | .. | .063 |
| 7 | .026 | 59 | .040 | 60 | .040 | 60 | *.041 | 61 | .039 | 63 | ..... | .. | ..... | .. | 23.983 | 64 | 23.980 | 62 | *23.978 | 61 | 23.980 | 61 | 23 982 | 60 | ..... | .. | ..... | .. | .063 |
| 8 | *24.008 | 59 | 24.007 | 60 | 24.006 | 61 | 24.003 | 61 | 24 001 | 61 | ..... | .. | ..... | .. | .944 | 63 | .944 | 63 | *.942 | 62 | .942 | 61 | .942 | 61 | 23.945 | 61 | ..... | .. | .066 |
| 9 | 23.975 | 59 | 23.983 | 61 | *23.986 | 62 | 23.985 | 63 | 22.982 | 61 | ..... | .. | ..... | .. | .934 | 63 | *.936 | 62 | .929 | 62 | .929 | 62 | .930 | 62 | ..... | .. | ..... | .. | .060 |
| 10 | 23.976 | 56 | *23.980 | 56 | *23.980 | 56 | 23.975 | 57 | 23.970 | 56 | ..... | .. | ..... | .. | .922 | 57 | .921 | 57 | *.920 | 58 | .921 | 58 | .924 | 57 | ..... | .. | ..... | .. | .060 |
| 11 | 24.004 | 56 | 24.010 | 56 | 24.015 | 58 | *24.016 | 58 | 24 011 | 58 | ..... | .. | ..... | .. | .950 | 58 | .946 | 59 | *.946 | 59 | .946 | 59 | .950 | 59 | ..... | .. | ..... | .. | .070 |
| 12 | 24.016 | 59 | 24.022 | 59 | *24.024 | 59 | 24.023 | 59 | 24.021 | 59 | ..... | .. | ..... | .. | .960 | 60 | .958 | 59 | .954 | 59 | *.953 | 59 | .956 | 58 | ..... | .. | ..... | .. | .071 |
| Total ..... | 36.191 | .... | 36.231 | .... | 36.243 | .. | 36.237 | .. | 36.206 | .. | ..... | .. | ..... | .. | 35.679 | .. | 35.654 | .. | 35.641 | .. | 35.635 | .. | 35.657 | .. | ..... | .. | ..... | .. | .692 |
| Mean ..... | 24.021 | .... | 24.026 | .... | *24.027 | .. | 24.0265 | .. | 24.023 | .. | ..... | .. | ..... | .. | 23.964 | .. | 22.9616 | .. | 23.9601 | .. | *23.9594 | .. | 23.962 | .. | ..... | .. | ..... | .. | .0691 |

## No. 7.

*Mean Barometrical Heights of all the half-hourly Observations made in* 1857, *compiled chiefly from table No.* 6.

| | 7 A. M. | 9 A. M. | 9½ A. M. | 10 A. M. | 10½ A. M. | 11 A. M. | 2 P. M. | 3 P. M. | 3½ P. M. | 4 P. M. | 4½ P. M. | 5 P. M. | 9 P. M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | |
| May | 23.986 | 24.011 | 24.0135 | *24.0145 | 24.0143 | 24.0115 | 23.971 | 23.959 | 23.954 | 23.9515 | *23.9501 | 23.953 | 23.994 |
| June | .967 | 23.9863 | 23.9908 | *23.9929 | 23.9923 | 23.9907 | .958 | .9446 | .9405 | .9372 | *.9352 | .9360 | .967 |
| July | .963 | 23.985 | 23.9886 | 23.9906 | *23.9915 | 23.9908 | .962 | .9171 | .9413 | .9379 | .9364 | *.9355 | .968 |
| August | .986 | 24.0132 | 24.0176 | 24.0197 | *24.0213 | 24.0201 | .981 | .9643 | .9600 | .9558 | *.9544 | *.9545 | .997 |
| September | .965 | 23 997 | 24.003 | 24.0078 | *24.0094 | 24.0080 | .963 | .952 | .947 | .943 | .9420 | *.9412 | .981 |
| October | .958 | 23.995 | 24.001 | *24.005 | 24.004 | 23 9995 | .947 | .931 | .927 | .9256 | *.9245 | .9253 | .967 |
| November | .939 | 23 978 | 23.983 | *23.9872 | *23.9872 | 23.985 | .936 | .922 | .917 | *.9145 | *.9145 | .9147 | .947 |
| December | .982 | 24.021 | 24.026 | *24.027 | 24.0263 | 24.023 | .976 | .964 | .9616 | .9601 | *.9594 | .962 | .989 |
| Total | 31.746 | 191.9665 | 192.0235 | 192.0447 | 192.0463 | 192.0286 | 31.694 | 191.5840 | 191.5484 | 191.5256 | 191.5165 | 191.5222 | 31.810 |
| Mean | 23.968 | 23.9983 | 24.0029 | 24.0056 | *24.0058 | 24.0036 | 23.962 | 23.9480 | 23.9435 | 23.9407 | 23.9396 | 23.9403 | 23.976 |

## No. 9.

*Mean Amplitudes of the Barometer, computed from table No. 6, for periods from six to six successive days.*

| | Days of the month. | | | | | | Mean amplitude. | Mean. | | Mthly mean amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|
| May | 10 | 11 | 12 | 13 | 14 | 15 | .060 | .0600 | May | .0666 |
| | 16 | 17 | 18 | 19 | 20 | 21 | .070 | .0690 | | |
| | 22 | 23 | 24 | 25 | 26 | 27 | .068 | | | |
| | 29 | 30 | 31 | 1 | 2 | 3 | .066 | .0650 | | |
| June | 4 | 5 | 6 | 7 | 8 | 9 | .064 | | June | .0603 |
| | 10 | 11 | 12 | 13 | 14 | 15 | .0563 | | | |
| | (16) | (17) | (18) | (19) | (20) | (21) | ..... | .0580 | | |
| | (22) | (23) | (24) | (25) | (26) | (27) | ..... | | | |
| | 28 | 29 | 30 | 1 | 2 | 3 | .0597 | | | |
| July | 4 | 5 | 6 | 7 | 8 | 9 | .0548 | .0555 | July | .0598 |
| | 10 | 11 | 12 | 13 | 14 | 15 | .0563 | | | |
| | 16 | 17 | 18 | 19 | 20 | 21 | .0625 | .0629 | | |
| | 22 | 23 | 24 | 25 | 26 | 27 | .0633 | | | |
| | 28 | 29 | 30 | 31 | 1 | 2 | .0645 | .0651 | | |
| August | 3 | 4 | 5 | 6 | 7 | 8 | .0657 | | August | .0699 |
| | 9 | 10 | 11 | 12 | 13 | 14 | .0688 | .0692 | | |
| | 15 | 16 | 17 | 18 | 19 | 20 | .0698 | | | |
| | (21) | (22) | (23) | (24) | 25 | 26 | .0755 | *.0710 | | |
| | 27 | 28 | 29 | 30 | 31 | 1 | .0750 | †.0701 | | |
| September | 2 | 3 | 4 | 5 | 6 | 7 | .0677 | | September | .0707 |
| | 8 | 9 | 10 | 11 | 12 | 13 | .0660 | | | |
| | (14) | (15) | (16) | (17) | (18) | (19) | ..... | .0763 | | |
| | 20 | 21 | 22 | 23 | 24 | 25 | .0763 | | | |
| | 26 | 27 | (28) | (29) | (30) | (1) | .0760 | .0785 | | |
| October | 2 | 3 | 4 | 5 | 6 | 7 | .0810 | | October | .0695 |
| | 8 | 9 | 10 | 11 | 12 | 13 | .0779 | .0818 | | |
| | 14 | 15 | 16 | (17) | 18 | 19 | .0858 | | | |
| | 20 | 21 | 22 | 23 | 24 | 25 | .0792 | .0842 | | |
| | 26 | 27 | 28 | 29 | 30 | 31 | .0892 | | | |
| November | 1 | 2 | 3 | 4 | 5 | 6 | .0817 | .0780 | November | .0768 |
| | 7 | 8 | 9 | 10 | 11 | 12 | .0743 | | | |
| | 13 | 14 | 15 | 16 | 17 | 18 | .0835 | .0780 | | |
| | 19 | 20 | 21 | 22 | 23 | 24 | .0725 | | | |
| | 25 | 26 | 27 | 28 | 29 | 30 | .0720 | ‡.0746 | | |
| December | (1) | (2) | (3) | 4 | 5 | 6 | .0773 | §.0738 | December | .0691 |
| | 7 | 8 | 9 | 10 | 11 | 12 | .0650 | .0650 | | |

* When computed from the four *mean* amplitudes.
† When computed from the twenty *single* amplitudes.
‡ When computed from the two *mean* amplitudes.
§ When computed from the nine *single* amplitudes.

NOTE.—The days in parentheses are days on which I was unable to make observations for want of time, or days on which I was absent from home.

CARACAS, *July* 16, 1858.

Under date of January 10 I sent you my meteorological registers for Colonia Tovar, for seven months ending with the last day of December, 1857, besides some other observations on the meteorology of that region.

The inclosed registers, which I send you this time, extend from the 1st of January to the 5th of June, 1858, for Colonia Tovar, and from the 16th to the 30th of June for Caracas.

On the 6th of June, after having sold my little property, I left Colonia Tovar, the place where I had lived for more than four years, and moved to Caracas. I am very sorry to say that on this journey, in endeavoring to measure some of the highest points of the difficult and dangerous mountain road, the barometer was accidentally broken, and hence the barometrical observations end with the 5th of June.

In February last I attempted to make a complete set of *half-hourly* barometrical observations, but after proceeding with this task for seven days I was compelled to leave off for want of time. The pressure of business at present also prevents me from sending anything more on meteorology this time.

A. FENDLER

*Register of Meteorological Observations for Colonia Tovar, Venezuela, from January 1, to June 5, 1858.*

| Date. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 2 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. | | | | | | | | | | | | | | | |
| Jan. 1 | 23.976 | 23.980 | 24.094 | 55 | 65 | 55 | 54 | 64 | 52 | 56.7 | ..... | 52 | 6[illegible] | 49 | Temp. at 6¾ a. m. 50°. |
| 2 | .998 | 988 | 24.006 | 53 | 61 | 58 | 53 | 59 | 55 | 55.7 | ..... | 46 | 58½ | 55 | |
| 3 | .984 | .972 | 23.974 | 56 | 60 | 54 | 56 | 59 | 51 | 55.3 | ..... | 53 | 52 | 49 | |
| 4 | .964 | .970 | .978 | 52 | 64 | 56 | 51 | 63 | 53 | 55.7 | ..... | 47 | 52 | 48 | |
| 5 | .962 | .952 | .992 | 54 | 64 | 55 | 55 | 63 | 52 | 56.7 | ..... | 52 | 52 | 49 | |
| 6 | .998 | .976 | .998 | 55 | 63 | 57 | 53 | 60 | 55 | 56.0 | ..... | 51½ | 59 | 53 | |
| 7 | .980 | .972 | .996 | 53 | 60 | 56 | 55 | 61 | 53 | 56.3 | ..... | 46 | 57 | 51 | Temp. at 6¼ a. m. 51°. |
| 8 | .960 | .984 | .974 | 53 | 60 | 50 | 53 | 59 | 47 | 53.0 | ..... | 48 | 55 | 37 | |
| 9 | .950 | .960 | .982 | 50 | 61 | 54 | 49 | 64 | 50 | 54.3 | ..... | 46 | 58 | 48 | Temp. at 6½ a. m. 48°. |
| 10 | .960 | .980 | .988 | 50 | 61 | 56 | 48 | 65 | 53 | 55.3 | ..... | 47 | 59 | 52 | Temp. at 6½ a. m. 48°. |
| 11 | .970 | .976 | .970 | 52 | 59 | 53 | 51 | 57 | 53 | 53.7 | ..... | 47 | 55 | 42 | Temp. at 6.40 a. m. 48°. |
| 12 | .944 | .978 | .982 | 50 | 61 | 54 | 50 | 60 | 52 | 54.0 | ..... | 48 | 57 | 48 | Temp. at 6.40 a. m. 48°. |
| 13 | .960 | .972 | .972 | 50 | 62 | 55 | 49 | 61 | 52 | 54.0 | ..... | 46 | 56 | 49 | Temp. at 6.40 a. m. 47°. |
| 14 | .950 | .970 | .956 | 49 | 62 | 53 | 49 | 63 | 50 | 54.0 | ..... | 42 | 56 | 44 | |
| 15 | .940 | .966 | .960 | 51 | 64 | 53 | 49 | 65 | 49 | 54.3 | ..... | 45 | 58 | 44 | |
| 16 | .935 | .964 | .976 | 49 | 64 | 54 | 48 | 63 | 51 | 54.0 | ..... | 43 | 55 | 48 | Temp. at 6.40 a. m. 45°. |
| 17 | .942 | .952 | .958 | 53 | 59 | 57 | 51 | 59 | 53 | 54.3 | ..... | 49 | 55 | 52 | |
| 18 | .942 | .942 | .950 | 54 | 59 | 56 | 54 | 58 | 52 | 54.7 | ..... | 52 | 55 | 51 | |
| 19 | .956 | .950 | .974 | 54 | 61 | 58 | 54 | 60 | 56 | 56.7 | ..... | 52 | 53 | 55 | |
| 20 | .984 | .980 | 24.000 | 56 | 60 | 59 | 55 | 61 | 57 | 57.7 | ..... | 54 | 58 | 57 | |
| 21 | 24.028 | 24.020 | 24.022 | 58 | 63 | 59 | 59 | 62 | 58 | 59.7 | ..... | 56 | 57 | 57 | |
| 22 | 24.002 | 23.990 | 23.995 | 57 | 63 | 59 | 55 | 64 | 56 | 58.3 | ..... | 54 | 57 | 55 | |
| 23 | 23.968 | .974 | .990 | 56 | 65 | 59 | 57 | 67 | 57 | 60.3 | ..... | 52 | 55 | 54 | |
| 24 | .956 | .956 | .980 | 56 | 65 | 57 | 60 | 67 | 54 | 60.3 | ..... | 49 | 57 | 51 | Temp. at 6.30 a. m. 51°. |
| 25 | .968 | .964 | .974 | 56 | 64 | 54 | 56 | 64 | 52 | 57.3 | ..... | 44 | 57 | 46 | |
| 26 | .966 | .956 | .966 | 53 | 60 | 55 | 52 | 57 | 51 | 53.3 | ..... | 50 | 55 | 49 | Thunder at 7 p. m. |
| 27 | .958 | .970 | .978 | 52 | 60 | 54 | 53 | 61 | 51 | 55.0 | ..... | 49 | 56 | 48 | |
| 28 | .962 | .956 | .966 | 52 | 61 | 55 | 52 | 62 | 53 | 55.7 | ..... | 49 | 58 | 51 | |
| 29 | .956 | .950 | .984 | 53 | 62 | 59 | 53 | 64 | 56 | 57.7 | ..... | 51 | 58 | 55 | |
| 30 | .968 | .978 | .990 | 55 | 62 | 56 | 54 | 63 | 5[illegible] | 55.7 | ..... | 52 | 58 | 49 | |
| 31 | .962 | .976 | .972 | 53 | 61 | 55 | 53 | 61 | 52 | 55.3 | ..... | 48 | 55 | 49 | |
| Total... | 129.939 | 123.104 | 123.425 | ..... | ..... | ..... | 1641 | 1916 | 1636 | 1731.0 | ..... | 1580.5 | 1744.5 | 1545 | |
| Mean... | 23 966 | 23.971 | 23.981 | ..... | ..... | ..... | 52.9 | 61.8 | 52.8 | 55.8 | ..... | 49.0 | 56.3 | 49.8 | |
| | 23.972 | | | | | | 55.6 | | | | | 51.7 | | | |

No. 6.—*Half-hourly Barometrical Observations*—Continued.

| Date. | 9 A. M. | Ther. | 9½ A. M. | Ther. | 10 A. M. | Ther. | 10½ A. M. | Ther. | 11 A. M. | Ther. | 11½ A. M. | Ther. | 12 M. | Ther. | 3 P. M. | Ther. | 3½ P. M. | Ther. | 4 P. M. | Ther. | 4½ P. M. | Ther. | 5 P. M. | Ther. | 5½ P. M. | Ther. | 6 P. M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dec. 4 | 24.054 | 60 | *24.056 | 61 | *24.056 | 61 | 24.056 | 62 | 24.054 | 65 | ..... | .. | ..... | .. | 23.990 | 64 | 23.983 | 63 | 23.980 | 63 | *23.974 | 63 | 23.980 | 63 | ..... | .. | ..... | .. | .082 |
| 5 | .064 | 61 | .068 | 61 | .067 | 62 | *.069 | 63 | .062 | 63 | ..... | .. | ..... | .. | 23.990 | 60 | 23.990 | 61 | 23.986 | 61 | *23.982 | 61 | 23.984 | 61 | ..... | .. | ..... | .. | .087 |
| 6 | .058 | 59 | .065 | 60 | *.069 | 62 | *.069 | 62 | .066 | 63 | ..... | .. | ..... | .. | *24.006 | 63 | 24.006 | 62 | 24.006 | 62 | 24.008 | 61 | 24.009 | 60 | ..... | .. | ..... | .. | .063 |
| 7 | .036 | 59 | .040 | 60 | .040 | 60 | *.041 | 61 | .039 | 63 | ..... | .. | ..... | .. | 23.983 | 64 | 23.980 | 62 | *23.978 | 61 | 23.980 | 61 | 23.982 | 60 | ..... | .. | ..... | .. | .063 |
| 8 | *24.008 | 59 | 24.007 | 60 | 24.006 | 61 | 24.003 | 61 | 24.001 | 61 | ..... | .. | ..... | .. | .944 | 63 | .944 | 63 | *.942 | 62 | .942 | 61 | .942 | 61 | 23.945 | 61 | ..... | .. | .066 |
| 9 | 23.975 | 59 | 23.983 | 61 | *23.986 | 62 | 23.985 | 63 | 22.982 | 61 | ..... | .. | ..... | .. | .934 | 63 | *.926 | 62 | .929 | 62 | .929 | 62 | .930 | 62 | ..... | .. | ..... | .. | .060 |
| 10 | 23.976 | 56 | *23.980 | 56 | *23.980 | 56 | 23.975 | 57 | 23.970 | 56 | ..... | .. | ..... | .. | .922 | 57 | .921 | 57 | *.920 | 58 | .921 | 58 | .924 | 57 | ..... | .. | ..... | .. | .060 |
| 11 | 24.004 | 56 | 24.010 | 56 | 24.015 | 58 | *24.016 | 58 | 24.011 | 58 | ..... | .. | ..... | .. | .950 | 58 | .946 | 59 | *.946 | 59 | .946 | 59 | .950 | 59 | ..... | .. | ..... | .. | .070 |
| 12 | 24.016 | 59 | 24.022 | 59 | *24.024 | 59 | 24.023 | 59 | 24.021 | 59 | ..... | .. | ..... | .. | .960 | 60 | .958 | 59 | .954 | 59 | *.953 | 59 | .956 | 58 | ..... | .. | ..... | .. | .071 |
| Total ..... | 36.191 | .... | 36.231 | .... | 36.243 | .. | 36.237 | .. | 36.206 | .. | ..... | .. | ..... | .. | 35.679 | .. | 35.654 | .. | 35.641 | .. | 35.635 | .. | 35.657 | | ..... | .. | ..... | .. | .622 |
| Mean ..... | 24.021 | .... | 24.026 | .... | *24.027 | .. | 24.0263 | .. | 24.023 | .. | ..... | .. | ..... | .. | 23.964 | .. | 22.9616 | .. | 23.9601 | .. | *23.9594 | .. | 23.962 | .. | ..... | .. | ..... | .. | .0691 |

## No. 7.

*Mean Barometrical Heights of all the half-hourly Observations made in* 1857, *compiled chiefly from table No.* 6.

| | 7 A. M. | 9 A. M. | 9½ A. M. | 10 A. M. | 10½ A. M. | 11 A. M. | 2 P. M. | 3 P. M. | 3½ P. M. | 4 P. M. | 4½ P. M. | 5 P. M. | 9 P. M. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1857. | | | | | | | | | | | | | |
| May | 23.986 | 24.011 | 24.0135 | *24.0145 | 24.0143 | 24.0115 | 23.971 | 23.959 | 23.954 | 23.9515 | *23.9501 | 23.953 | 23.994 |
| June | .967 | 23.9863 | 23.9908 | *23.9929 | 23.9923 | 23.9907 | .958 | .9446 | .9405 | .9372 | *.9352 | .9360 | .967 |
| July | .963 | 23.985 | 23.9886 | 23.9906 | *23.9915 | 23.9908 | .962 | .9171 | .9413 | .9379 | .9364 | *.9355 | .968 |
| August | .986 | 24.0132 | 24.0176 | 24.0197 | *24.0213 | 24.0201 | .981 | .9643 | .9600 | .9558 | *.9544 | *.9545 | .997 |
| September | .965 | 23.997 | 24.003 | 24.0078 | *24.0094 | 24.0080 | .963 | .952 | .947 | .943 | .9420 | *.9412 | .981 |
| October | .958 | 23.995 | 24.001 | *24.005 | 24.004 | 23.9995 | .947 | .931 | .927 | .9256 | *.9245 | .9253 | .967 |
| November | .939 | 23.978 | 23.983 | *23.9872 | *23.9872 | 23.985 | .936 | .922 | .917 | *.9145 | *.9145 | .9147 | .947 |
| December | .982 | 24.021 | 24.026 | *24.027 | 24.0263 | 24.023 | .976 | .964 | .9616 | .9601 | *.9594 | .962 | .989 |
| Total | 31.746 | 191.9865 | 192.0235 | 192.0447 | 192.0463 | 192.0286 | 31.694 | 191.5840 | 191.5484 | 191.5256 | 191.5165 | 191.5222 | 31.810 |
| Mean | 23.968 | 23.9983 | 24.0029 | 24.0056 | *24.0058 | 24.0036 | 23.962 | 23.9480 | 23.9435 | 23.9407 | 23.9396 | 23.9403 | 23.976 |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. | | | | | | | | | | | | | | | | | | | | |
| Jan. 25 | ..... | ..... | 8 | W..... | 2 | Higher | 5 | SE..... | 2¼ | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 26 | 2 15 p. m.. | 2.35 p. m.. | 8 | N..... | 2 | ..... | 10 | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 6 p. m..... | 6.20 p. m.. | | | | | | E. ..... | 2 | | | | | | | | | | | |
| 27 | ..... | ..... | 4 | SE..... | 2 | ..... | 6 | SE..... | 2¼ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 28 | ..... | ..... | 5 | ..... | ..... | ..... | 7 | SE..... | 2¼ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | E..... | 2 | | | | | | | | | | | | | | | |
| 29 | ..... | ..... | 1 | ..... | ..... | ..... | 5 | SE..... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 30 | ..... | ..... | 1 | ..... | ..... | ..... | 7 | SW.. ... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.... | 2 |
| 31 | ..... | ..... | 10 | ..... | ..... | ..... | 8 | S..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| Total... | ..... | ..... | 102 | ..... | ..... | ..... | 220 | ..... | ..... | ..... | 88 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 3.3 | ..... | ..... | ..... | 7.1 | ..... | ..... | ..... | 2.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

| Date. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. Feb. 1 | 23.980 | 23.992 | 24.020 | 54° | 62° | 58° | 55° | 61° | 56° | 57.3 | ..... | 51° | 52° | 53° | |
| 2 | 24.010 | 24.012 | 24.006 | 55 | 63 | 53 | 56 | 63 | 49 | 56.0 | ..... | 54 | 56 | 42 | |
| 3 | 24.998 | 24.016 | 24.030 | 52 | 65 | 55 | 53 | 64 | 54 | 57.0 | ..... | 41 | 55 | 50 | |
| 4 | 24.013 | 24.018 | 24.048 | 54 | 60 | 56 | 53 | 60 | 53 | 55.3 | ..... | 52 | 51 | 51 | |
| 5 | 24.025 | 24.025 | 24.024 | 55 | 60 | 54 | 53 | 62 | 51 | 55.3 | ..... | 52 | 55 | 49 | |
| 6 | 24.002 | 24.018 | 23.996 | 53 | 63 | 55 | 54 | 63 | 53 | 56.7 | ..... | 50 | 52 | 48 | |
| 7 | 23.975 | 23.980 | 23.997 | 54 | 61 | 55 | 54 | 62 | 52 | 56.0 | ..... | 52 | 58 | 50 | |
| 8 | .972 | .966 | 23.994 | 58 | 62 | 59 | 58 | 61 | 58 | 59.3 | ..... | 54 | 57 | 56 | |
| 9 | .980 | .990 | 24.008 | 57 | 63 | 60 | 58 | 63 | 58 | 59.7 | ..... | 56 | 59 | 57 | |
| 10 | .978 | .977 | 23.978 | 58 | 64 | 58 | 58 | 65 | 55 | 59.3 | ..... | 56 | 61 | 54 | |
| 11 | ..... | ..... | ..... | ..... | ..... | ..... | 54 | 62 | 56 | 57.3 | ..... | 52 | 58 | 53 | |
| 12 | ..... | ..... | ..... | ..... | ..... | ..... | 53 | 63 | 53 | 56.3 | ..... | 50 | 60 | 51 | |
| 13 | ..... | ..... | ..... | ..... | ..... | ..... | 55 | 65 | 54 | 58.0 | ..... | 52 | 61 | 53 | |
| 14 | ..... | ..... | ..... | ..... | ..... | ..... | 56 | 62 | 52 | 56.7 | ..... | 51 | 57 | 48 | |
| 15 | ..... | ..... | ..... | ..... | ..... | ..... | 54 | 60 | 51 | 55.0 | ..... | 48 | 56 | 46 | |
| 16 | ..... | ..... | ..... | ..... | ..... | ..... | 53 | 59 | 52 | 54.7 | ..... | 42 | 52 | 48 | |
| 17 | ..... | ..... | ..... | ..... | ..... | ..... | 54½ | 61 | 55 | 56.8 | ..... | 50 | 55 | 52 | |
| 18 | ..... | ..... | ..... | ..... | ..... | ..... | 53 | 63 | 55 | 57.0 | ..... | 49 | 60 | 53 | |
| 19 | ..... | ..... | ..... | ..... | ..... | ..... | 55 | 64 | 56 | 58.0 | ..... | 52 | 58 | 52 | |
| 20 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 63 | 58 | 59.3 | ..... | 53 | 59 | 56 | |
| 21 | ..... | ..... | ..... | ..... | ..... | ..... | 54 | 63 | 55 | 57.3 | ..... | 49 | 60 | 48 | |
| 22 | ..... | ..... | ..... | ..... | ..... | ..... | 57 | 68 | 51 | 58.7 | ..... | 46 | 60 | 45 | |
| 23 | ..... | ..... | ..... | ..... | ..... | ..... | 55 | 64 | 51 | 56.7 | ..... | 48 | 56 | 46 | |
| 24 | ..... | ..... | ..... | ..... | ..... | ..... | 52 | 69 | 52 | 57.7 | ..... | 44 | 57 | 45 | Temp. at 6½ a. m. 48°. |
| 25 | ..... | ..... | ..... | ..... | ..... | ..... | 61 | 68 | 53 | 60.7 | ..... | 44 | 57 | 50 | |
| 26 | ..... | ..... | ..... | ..... | ..... | ..... | 58 | 66 | 52 | 58.7 | ..... | 42 | 59 | 50 | |
| 27 | ..... | 23.924 | 23.918 | 50 | 65 | 57 | 51 | 65 | 55 | 57.3 | ..... | 47 | 55 | 50 | |
| 28 | 23.904 | 23.906 | 23.910 | 54 | 61 | 55 | 55 | 60 | 51 | 55.3 | ..... | 51 | 55 | 49 | |
| Total... | ..... | ..... | ..... | ..... | ..... | ..... | 1539.5 | 1771 | 1500 | 1603.4 | ..... | 1388 | 1593 | 1405 | |
| Mean... | ..... | ..... | ..... | ..... | ..... | ..... | 55.0 | 63.2 | 53.6 | 57.3 | ..... | 49.6 | 56.9 | 50.2 | |
| | | | | | | | 57.3 | | | | | 52.2 | | | |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. Jan. 25 | ..... | ..... | 8 | W ..... | 2 | Higher. | 5 | SE..... | 2¼ | ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 26 | 2 15 p. m.. | 2.35 p. m.. | 8 | N..... | 2 | ..... | 10 | ..... | ..... | ..... | 6 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 6 p. m..... | 6.20 p. m.. | | | | | | E. ..... | 2 | | | | | | | | | | | |
| 27 | ..... | ..... | 4 | SE..... | 2 | ..... | 6 | SE..... | 2¼ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 28 | ..... | ..... | 5 | ..... | ..... | ..... | 7 | SE..... | 2¼ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | | | | E..... | 2 | | | | | | | | | | | | | | | |
| 29 | ..... | ..... | 1 | ..... | ..... | ..... | 5 | SE..... | 2 | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 30 | ..... | ..... | 1 | ..... | ..... | ..... | 7 | SW.. ... | 1 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.... | 2 |
| 31 | ..... | ..... | 10 | ..... | ..... | ..... | 8 | S..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| Total... | ..... | ..... | 102 | ..... | ..... | ..... | 220 | ..... | ..... | ..... | 88 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 3.3 | ..... | ..... | ..... | 7.1 | ..... | ..... | ..... | 2.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 27 | | | 3 | | | H. | 5 | N. | 2 | M. | 0 | | | | | | | | | |
| 28 | | | | | | | 7 | S. W. S. W. | 2 2 2 2 | M. | 0 | N. | 3 | | | | | | | |
| Total | | | 84 | | | | 208 | | | | 59 | | | | | | | | | |
| Mean | | | 3.0 | | | | 7.4 | | | | 2.1 | | | | | | | | | |

*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. | | | | | | | | | | | | | | | | | | | | |
| Feb. 1 | ..... | ..... | 5 | S..... | 2 | ..... | 4 | S..... | 2 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 2 | ..... | ..... | 1 | ..... | ..... | ..... | 5 | ..... | ..... | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 3 | ..... | ..... | 0 | ..... | ..... | ..... | 4 | E..... | 2½ | ..... | 1 | ..... | ..... | ..... | N.W... | 2½ | ..... | ..... | S..... | 2½ |
| 4 | ..... | ..... | 10 | E.S.E.... | 2 | ..... | 3 | SE..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 5 | ..... | ..... | 9 | E.S.E... | 2 | ..... | 8 | SE..... | 2½ | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 6 | 6 a. m.... | 6.20 a. m.. | 1 | ..... | ..... | ..... | 3 | SE..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 11 a. m.... | 11.30 a. m. | | | | | | | | | | | | | | | | | | |
| 7 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S. ..... | 2½ | ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.... | 2 |
| 8 | ..... | ..... | 0 | ..... | ..... | ..... | 7 | S. ..... | 2½ | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 9 | ..... | ..... | 4 | S.S.W.. | 2 | ..... | 10 | SE..... | 2 | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 10 | ..... | ..... | 2 | N.N.W.. | 1 | ..... | 9 | SE. & S.. | 2<br>2½ | } M..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 11 | ..... | ..... | 0 | ..... | ..... | ..... | 8 | ..... | ..... | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S..... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 13 | ..... | ..... | 6 | ..... | ..... | ..... | 8 | S.S.E.... | 2½ | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 14 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S.S.E.... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 15 | ..... | ..... | 2 | SW ..... | 2 | M.H... | 9 | SW..... | 1 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 16 | ..... | ..... | 6 | Very dry.<br>W..... | 2 | H. cirr cum. | 10 | SE..... | 1 | M..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 17 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S.S.E.... | 1 | ..... | 1 | S..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18 | ..... | ..... | 1 | ..... | ..... | ..... | 8 | ..... | ..... | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | ..... | ..... | 0 | ..... | ..... | ..... | 10 | NW..... | 2 | ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 20 | ..... | ..... | 1 | ..... | ..... | ..... | 10 | SE..... | 2 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 21 | ..... | ..... | 10 | NW.. .. | 2 | ..... | 10 | SE..... | 2½ | ..... | 7 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | ..... | ..... | 6 | SW..... | 1 | H. .... | 8 | N..... | 2 | M..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 23 | ..... | ..... | 6 | Station.. | ..... | H. ... | 9 | E.S.E.... | 2 | ..... | 8 | Station.. | ..... | H. thin | ..... | ..... | ..... | ..... | SW... | 2 |
| 24 | ..... | ..... | 2 | Station.. | ..... | H. ... | 4 | S.....<br>E..... | 2½<br>2½ | } M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| 25 | ..... | ..... | 0 | ..... | ..... | ..... | 5 | N.....<br>E.S.E... | 2<br>2 | } M..... | 1 | Station.. | ..... | H. .... | NW...<br>Extraordinarily | 1 | ..... | ..... | ..... | ..... |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 26 | ..... | ..... | 6 | S. ..... | 2 | N. ... | 8 | N. ..... | 2 | M. ..... | 4 | N. ..... | 2 | ..... | NW. ... | 2 | ..... | ..... | ..... | ..... |
| 27 | ..... | ..... | 1 | Station's | ..... | H. ... | 5 | N. ..... | 2 | M. ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | W. ..... | 2 | | | | | | | | | | | |
| 28 | ..... | ..... | 3 | ..... | ..... | ..... | 7 | S. ..... | 2 | M. .... | 0 | N. ..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | W. ..... | 2 | | | | | | | | | | | |
| Total... | ..... | ..... | 84 | ..... | ..... | ..... | 208 | ..... | ..... | ..... | 59 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 3.0 | ..... | ..... | ..... | 7.4 | ..... | .... | ..... | 2.1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined. | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. | | | | | | | | | | | | | | | | | | | | |
| April 19 | ..... | ..... | 10 | S..... | 2 | M..... | 9 | W..... | 2½ | Cirr. .... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | E..... | 2½ | L..... | ..... | SE..... | 2½ | M. | | | | | | | | | | |
| | | | | | | | | E. ..... | 3 | L. | | | | | | | | | | |
| 20 | ..... | ..... | 10 | N.NE.... | 1 | M..... | 8 | E.SE.... | 2½ | M..... | 6 | ..... | ..... | ..... | ..... | .... | ..... | ..... | ..... | ..... |
| 21 | 1.45 p. m.. | 2.30 p. m.. | 1 | ..... | ..... | ..... | 10 | ..... | ..... | ..... | 5 | W..... | 2 | Cirr... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 3.40 p. m.. | 5.15 p. m.. | ..... | ..... | ..... | ..... | ..... | E. ..... | 1 | L..... | ..... | ..... | ..... | Cumul. | | | | | | |
| | Mist. | | | | | | | | | | | | | | | | | | | |
| 22 | ..... | ..... | 5 | S..... | 2½ | M.... | 10 | S.SE.... | 2 | M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW.... | 2 |
| | | | | SE..... | 2½ | | | | | | | | | | | | | | | |
| 23 | ..... | ..... | 3 | W..... | 2 | H..... | 4 | W.SW.... | 1 | H..... | 4 | S..... | 2 | M..... | ..... | ..... | ..... | ..... | SW... | 2 |
| | | | | | | | | SE..... | 2 | M. | | | | | | | | | | |
| 24 | ..... | ..... | 2 | SW..... | 1 | H. .... | 6 | SE..... | 2 | M..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW... | 2 |
| 25 | ..... | ..... | 2 | S.SW.... | 2 | H. .... | 8 | NE..... | 2 | M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W... | 1 |
| 26 | ..... | ..... | 2 | ..... | ..... | ..... | 10 | SE..... | 2 | M..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW... | 2 |
| 27 | ..... | ..... | 2 | SE..... | 3 | M. .... | 8 | SE..... | 3 | M..... | 4 | S..... | 2½ | M..... | ..... | ..... | ..... | ..... | E. .... | 2 |
| 28 | ..... | ..... | 2 | SW..... | 2 | M., H.. | 3 | SE..... | 2½ | M..... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.SW. | 2 |
| 29 | ..... | ..... | 4 | W.SW... | 1 | H. .... | 10 | S.SE..... | 2½ | M. ..... | 10 | S..... | 2 | M..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 30 | ..... | ..... | 5 | SE ..... | 2½ | M..... | 7 | SE..... | 2½ | M..... | 7 | S. ..... | 2 | M..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 31 | ..... | ..... | 6 | SW. .... | 1 | H..... | 9 | S.SE.... | 2 | M..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW... | 2 |
| | | | | NE..... | 2 | M. | | | | | | | | | | | | | | |
| Total... | ..... | ..... | 106 | ..... | ..... | ..... | 257 | ..... | ..... | ..... | 103 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 3.4 | ..... | ..... | ..... | 8.3 | ..... | ..... | ..... | 3.3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| April 1 | 23.968 | 23.982 | 23.972 | 59 | 67 | 63 | 57 | 66 | 60 | 61.0 | ..... | 55 | 59 | 58 | |
| 2 | .974 | .948 | .998 | 61 | 63 | 62 | 62 | 62 | 59 | 61.0 | ..... | 59 | 59 | 57 | |
| 3 | .948 | .950 | .972 | 59 | 65 | 61 | 58 | 64 | 60 | 60.7 | ..... | 56 | 58 | 57 | |
| 4 | .972 | .984 | .984 | 58 | 64 | 62 | 56 | 68 | 60 | 61.3 | ..... | 55 | 61 | 57 | |
| 5 | .982 | .968 | .968 | 58 | 65 | 62 | 58 | 65 | 60 | 61.0 | ..... | 56 | 58 | 56 | |
| 6 | .980 | .958 | .982 | 59 | 66 | 63 | 59 | 66 | 61 | 62.0 | ..... | 55 | 57 | 58 | |
| 7 | .970 | .958 | .960 | 58 | 65 | 60 | 57 | 68 | 58 | 61.0 | ..... | 55 | 58 | 54 | |
| 8 | .952 | .934 | .942 | 58 | 65 | 58 | 60 | 66 | 56 | 60.7 | ..... | 55 | 56½ | 50 | |
| 9 | .928 | .930 | .946 | 57 | 64 | 59 | 58 | 64 | 55 | 59.0 | ..... | 54 | 58 | 53 | |
| 10 | .934 | .936 | .935 | 57 | 64 | 59 | 60 | 64 | 56 | 60.0 | ..... | 53 | 58½ | 52 | |
| 11 | .912 | .916 | .920 | 57 | 64 | 62 | 59 | 65 | 60 | 61.3 | ..... | 54 | 59 | 57 | |
| 12 | .907 | .908 | .910 | 59 | 64 | 60 | 59 | 61 | 56 | 58.7 | ..... | 55 | 57 | 53 | Thunder, very faint and of short duration. |
| 13 | .937 | .942 | .943 | 59 | 64 | 60 | 58 | 64 | 57 | 59.7 | ..... | 56 | 60 | 56 | |
| 14 | .954 | .972 | .978 | 59 | 65 | 61 | 59 | 64 | 58½ | 60.5 | ..... | 55 | 58 | 57 | |
| 15 | .986 | .992 | .980 | 60 | 66 | 62 | 57 | 69 | 59 | 61.7 | ..... | 56 | 58 | 58 | |
| 16 | .944 | .970 | .950 | 59 | 68 | 62 | 58 | 69 | 59 | 62.0 | ..... | 55½ | 54 | ..... | |
| 17 | .953 | .966 | .959 | 58 | 67 | 60 | 60 | 70 | 58 | 62.7 | ..... | 50 | 58 | 52 | |
| 18 | .970 | .986 | .973 | 59 | 65 | 59 | 58 | 66 | 57½ | 60.5 | ..... | 54 | 59 | 49 | |
| 19 | .980 | .985 | .958 | 57 | 66 | 59 | 59 | 72 | 55 | 62.0 | ..... | 51 | 62 | 47 | Thunder, very faint, at 3.45 p. m. |
| 20 | .961 | .968 | .944 | 58 | 66 | 59 | 58 | 66 | 55 | 59.7 | ..... | 53 | 59 | 48 | |
| 21 | .942 | .922 | .924 | 57 | 65 | 60 | 57 | 68 | 56 | 60.3 | ..... | 51 | 60 | 54 | |
| 22 | .932 | .948 | .954 | 57 | 66 | 57 | 60 | 67 | 55 | 60.7 | ..... | 55 | 61 | 44 | |
| 23 | .954 | .950 | .959 | 57 | 64 | 59 | 59 | 68 | 58 | 61.7 | ..... | 56 | 61 | 51 | |
| 24 | .942 | .962 | .970 | 58 | 65 | 61 | 60 | 65 | 57½ | 60.8 | ..... | 54½ | 60 | 56 | |
| 25 | .946 | .938 | .942 | 59 | 65 | 61 | 59 | 65 | 57 | 60.3 | ..... | 56 | 59 | 55 | |
| 26 | .938 | .964 | .966 | 59 | 67 | 62 | 59 | 67 | 59 | 61.7 | ..... | 56 | 56 | 54 | |
| 27 | .980 | .986 | .990 | 60 | 67 | 63 | 60 | 66 | 61 | 62.3 | ..... | 56 | 59 | 55 | |
| 28 | .992 | .990 | .994 | 62 | 64 | 62 | 62 | 63 | 59 | 61.3 | ..... | 59 | 59 | 57 | |
| 29 | .992 | .950 | .942 | 60 | 63 | 60 | 57 | 60 | 57 | 58.0 | ..... | 57 | 58½ | 55 | |
| 30 | .990 | .990 | .918 | 58 | 64 | 59 | 59 | 64 | 57 | 60.0 | ..... | 56 | 59 | 55 | |
| Total... | 1.580 | 1.692 | 1.733 | ..... | ..... | ..... | 1762 | 1972 | 1736.5 | 1823.6 | ..... | 1649 | 1760.5 | 1622 | |
| Mean... | 23.953 | 23.956 | 23.958 | ..... | ..... | ..... | 58.7 | 65.7 | 57.9 | 60.7 | ..... | 55.0 | 58.7 | 54.1 | |
| | 23.956 | | | | | | 60.7 | | | | | 55.9 | | | |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. | | | | | | | | | | | | | | | | | | | | |
| April 1 | 8.55 p. m. | 9.5 p. m. | 9 | S. | 2½ | M. | 8 | S.<br>S. | 2½<br>3 | H.<br>M. | 10 | | | | | | | | | |
| 2 | 1.15 p. m. | 1.20 p. m. | 2 | E.SE.<br>E SE | 2<br>2 | M.<br>L. | 10 | S.SE | 2 | M. | 2 | | | | | | | | SW | 2 |
| 3 | | | 9 | SE<br>E.SE | 2½<br>3 | M.<br>L. | 10 | S. | 2 | M. | 10 | | | | | | | | | |
| 4 | | | 10 | S.<br>E. | 2½<br>2 | <br>L. | 8 | S. | 1 | M. | 10 | | | | | | | | | |
| 5 | | | 6 | NE. | 1 | M. | 9 | SW<br>S. | 2<br>2 | Above M.<br>M. | 3 | | | | | | | | SW | 1 |
| 6 | | | 6 | S. | 2 | M., H. | 8 | S.SW.<br>SE | 2½<br>2 | M., H<br>M. | 3 | | | | | | | | | |
| 7 | | | 7 | SW. | 1 | M., H. | 9 | S. | 1 | M. | 1 | | | | | | | | | |
| 8 | | | 2 | | | | 9 | E. | 1 | M., H | 1* | | | | | | | | SW | 2 |
| 9 | | | 5 | W. | 2½ | Cirr. | 9 | S. | 1 | M., H | 1 | | | | | | | | SW | 2 |
| 10 | | | 3 | W. | 2 | Cirr. | 10 | W.<br>S. and E. | 1<br>1 | M., H.<br>M. | 0 | | | | | | | | SW | 2 |
| 11 | | | 2 | W. | 2 | Cirr | 9 | SE | 1 | M. | 7 | | | | | | | | | |
| 12 | | | 4 | SW. | 2 | M., H. | 10 | SW | 1 | M. | 1 | | | | | | | | SW | 1 |
| 13 | 2.10 p. m.<br>3.20 p. m. | 2.20 p. m.<br>5.30 p. m. | 2 | SW | 1 | M., H. | 10 | S. | 2 | M. | 4 | | | | | | | | SW | 1 |
| 14 | | | 5 | SE | 2 | M. | 9 | S.SW.<br>SE | 2<br>1 | M., H<br>M. | 9 | | | | | | | | | |
| 15 | | | 7 | SE | 2 | M., H. | 6 | SE | 2½ | M. | 3 | | | | | | | | | |
| 16 | | | 5 | W<br>E.SE. | 1<br>2½ | Cirr.<br>M. | 2 | ESE | 2½ | M. | 1 | | | | | | | | SW | 1 |
| 17 | | | 3 | W. | 1 | Cirr | 6 | W.<br>E.SE. | 1<br>2½ | H.<br>M. | 3 | | | | | | | | | |
| 18 | | | 7 | E | 2 | M. | 7 | E.NE. | 2 | M. | 1† | | | | | | | | NE | 1 |
| 19 | | | 8 | W. | 1 | H. | 7 | W.<br>SE. & N. | 1<br>2 | Cirr<br>M. | 3 | | | | | | | | SW | 1 |
| 20 | | | 5 | | | | 10 | NE | 2 | M. | 4 | | | | | | | | W | 2 |
| 21 | | | 10 | SE | 2 | M. | 9 | SE | 2 | M. | 3 | | | | | | | | SW | 1 |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | ..... | ..... | 2 | ..... | ..... | ..... | 7 | S..... | 2 | M..... | 1 | S.SW.... | 2 | ..... | ..... | ..... | ..... | ..... | SW... | 1 |
| 27 | ..... | ..... | 3 | W..... | 2 | H..... | 9 | S..... | 2½ | M..... | 6 | S.SW... | 2½ | M., H. | ..... | ..... | ..... | ..... | SW... | 1 |
| 28 | 4 p. m..... | 5.10 p. m.. | 8 | W.SW... | 2½ | M., H. | 9 | S.SW.... | 2½ | M..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S.SW.. | 1 |
| | 5.20 p. m.. | 5.40 p. m.. | ..... | S..... | 2 | M..... | | | | | | | | | | | | | | |
| 29 | 1 p. m..... | 1.35 p. m. | 10 | ..... | ..... | Fog... | 10 | SE..... | 2 | M..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 1.50 p. m.. | 4.20 p. m.. | | | | | | | | | | | | | | | | | | |
| 30 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S..... | 2 | M..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.SW.. | 2 |
| Total... | ..... | ..... | 161 | ..... | ..... | ..... | 256 | ..... | ..... | ..... | 115 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 5.4 | ..... | ..... | ..... | 8.5 | ..... | ..... | ..... | 3.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

* Clouds at 5 p. m. W. 2 H.; S. 2 M.
† Clouds at 11 a. m. SW. 2 H. cirr., exquisitely fine and regularly distributed; middle strata NE. 2½.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 2 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| May 1 | 23.918 | 23.939 | 23.947 | 57 | 64 | 59 | 57 | 65 | 57 | 59.7 | ..... | 51 | 59 | 53 | |
| 2 | .952 | .960 | .984 | 60 | 63 | 61 | 58 | 64 | 59 | 60.3 | ..... | 56½ | 60 | 58 | |
| 3 | .980 | .970 | .996 | 60 | 62 | 61 | 61 | 60 | 58 | 59.7 | ..... | 59½ | 59 | 58 | |
| 4 | .964 | .948 | .964 | 58 | 61 | 60 | 56 | 60 | 57 | 57.7 | ..... | 55 | 59 | 56 | Thunder at 6.50 p. m. |
| 5 | .958 | .962 | .980 | 58 | 65 | 62 | 57 | 65 | 59 | 60.3 | ..... | 57 | 58 | 56 | |
| 6 | .974 | .970 | .980 | 60 | 65 | 62 | 58 | 68 | 59 | 61.7 | ..... | 57 | 59 | 58 | |
| 7 | .982 | .970 | .980 | 57 | 64 | 62 | 55 | 66 | 60 | 60.3 | ..... | 54 | 58 | 58 | |
| 8 | .988 | .972 | .992 | 60 | 66 | 63 | 58 | 68 | 60 | 62.0 | ..... | 56 | 59 | 58 | |
| 9 | .989 | .965 | .967 | 59 | 65 | 62 | 60 | 70 | 61 | 63.7 | ..... | 56 | 60 | 58 | |
| 10 | .973 | .972 | .992 | 59 | 67 | 63 | 58 | 71 | 60 | 63.0 | ..... | 55 | 59 | 57 | |
| 11 | .996 | .994 | .990 | 61 | 65 | 59 | 62 | 66 | 56 | 61.3 | ..... | 58 | 60 | 53 | |
| 12 | .990 | .992 | .974 | 58 | 66 | 58 | 61 | 69 | 57 | 62.3 | ..... | 49 | 59 | 43½ | |
| 13 | .970 | .954 | .936 | 61 | 63 | 57 | 61 | 62 | 53 | 58.7 | ..... | 56 | 57 | 48 | |
| 14 | .938 | .936 | .952 | 60 | 63 | 60 | 61 | 64 | 59 | 61.3 | ..... | 56 | 58 | 57 | |
| 15 | .948 | .940 | .955 | 60 | 63 | 62 | 58 | 63½ | 60 | 60.5 | ..... | 56½ | 59 | 59 | |
| 16 | .972 | .942 | .978 | 61 | 63 | 62 | 58 | 62 | 59 | 59.7 | ..... | 57½ | 60 | 58 | |
| 17 | .980 | .976 | .970 | 61 | 65 | 62 | 59 | 65 | 59 | 61.0 | ..... | 58 | 59 | 59 | |
| 18 | .976 | .964 | .970 | 59 | 62 | 59 | 57 | 64 | 58 | 59.7 | ..... | 56 | 61 | 55 | |
| 19 | .970 | .976 | .972 | 57 | 64 | 57 | 57 | 66 | 54 | 59.0 | ..... | 55 | 59 | 49 | |
| 20 | .984 | .978 | .970 | 58 | 64 | 60 | 58 | 65 | 57 | 60.0 | ..... | 57 | 57 | 56 | |
| 21 | .980 | .974 | .974 | 60 | 65 | 62 | 60 | 65 | 59 | 61.3 | ..... | 57 | 59 | 58 | |
| 22 | 24.008 | .984 | .992 | 58 | 64 | 60 | 57 | 63 | 59 | 59.7 | ..... | 56½ | 60 | 57 | |
| 23 | 24.006 | .982 | 24.018 | 58 | 64 | 61 | 56 | 66 | 59 | 60.3 | ..... | 55 | 60 | 57½ | |
| 24 | 23.986 | .976 | 23.976 | 57 | 64 | 61 | 58 | 69 | 57 | 61.3 | ..... | 56 | 59 | 55 | |
| 25 | .960 | .986 | .976 | 57 | 65 | 57 | 57 | 65 | 54 | 58.7 | ..... | 53 | 57 | 45 | |
| 26 | .974 | .986 | .994 | 59 | 65 | 62 | 57 | 68 | 59 | 61.3 | ..... | 55 | 56 | 57 | |
| 27 | .994 | .996 | 24.000 | 58 | 61 | 60 | 56 | 61 | 58 | 58.3 | ..... | 55 | 58 | 57 | |
| 28 | .998 | .986 | 24.002 | 58 | 64 | 60 | 55 | 66 | 58 | 59.7 | ..... | 55 | 59 | 57 | |
| 29 | .998 | .992 | 24.000 | 56 | 61 | 60 | 56 | 62 | 58 | 58.7 | ..... | 52 | 58 | 56 | |
| 30 | .990 | .984 | 23.986 | 59 | 64 | 61 | 59 | 67 | 59 | 61.7 | ..... | 56 | 60 | 58 | |
| 31 | .980 | .950 | .974 | 59 | 64 | 60 | 57 | 68 | 59 | 61.3 | ..... | 56 | 62 | 57 | |
| Total ... | 123.230 | 2.167 | 123.341 | ..... | ..... | ..... | 1798 | 2023.5 | 1801 | 1874.2 | ..... | 1722.5 | 1827 | 1722 | |
| Mean. . | 23.972 | 23.970 | 23.979 | ..... | ..... | ..... | 58.0 | 65.3 | 58.1 | 60.5 | ..... | 55.6 | 58.9 | 55.5 | |
| | 23.974 | | | | | | 60.5 | | | | | 56.7 | | | |

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 22 | ..... | ..... | 1 | ..... | ..... | ..... | 8 | S ..... | 2 | M ..... | 0 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 1 |
| 23 | ..... | ..... | 9 | ..... | ..... | ..... | 10 | SE ..... | 2 | M ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | ..... | ..... | 2 | W..... | 1 | Cirr ... | 10 | SE ..... | 2 | M..... | 5 | SE..... | 2 | M..... | ..... | ..... | ..... | ..... | SW.... | 1 |
| 25 | ..... | ..... | 9 | S..... | 1 | M., H . | 9 | S..... | 2 | M ..... | 4 | S ..... | 2 | ..... | ..... | ..... | ..... | ..... | SW ... | 2 |
| 26 | ..... | ..... | 2 | ..... | ..... | ..... | 7 | S..... | 2 | M ..... | 1 | S.SW.... | 2 | ..... | ..... | ..... | ..... | ..... | SW ... | 1 |
| 27 | ..... | ..... | 3 | W..... | 2 | H..... | 9 | S..... | 2½ | M ..... | 6 | S.SW ... | 2½ | M., H . | ..... | ..... | ..... | ..... | SW ... | 1 |
| 28 | 4 p. m..... | 5.10 p. m.. | 8 | W.SW ... | 2½ | M., H . | 9 | S-SW.... | 2½ | M..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S SW.. | 1 |
| | 5.20 p. m.. | 5.40 p. m.. | ..... | S..... | 2 | M..... | | | | | | | | | | | | | | |
| 29 | 1 p. m ..... | 1.35 p. m. | 10 | ..... | ..... | Fog ... | 10 | SE ..... | 2 | M..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W..... | 2 |
| | 1.50 p. m.. | 4.20 p. m.. | | | | | | | | | | | | | | | | | | |
| 30 | ..... | ..... | 0 | ..... | ..... | ..... | 9 | S..... | 2 | M..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | W.SW.. | 2 |
| Total... | ..... | ..... | 161 | ..... | ..... | ..... | 256 | ..... | ..... | ..... | 115 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mean... | ..... | ..... | 5.4 | ..... | ..... | ..... | 8.5 | ..... | ..... | ..... | 3.8 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

* Clouds at 5 p. m. W. 2 H.; S. 2 M.
† Clouds at 11 a. m. SW. 2 H. cirr., exquisitely fine and regularly distributed; middle strata NE. 2½.

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 2 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M. | Thermometer in open air. Mean. | Psychrometer. Dry bulb. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ° | ° | ° | ° | ° | ° | ° | | ° | ° | ° | |
| 1858. | | | | | | | | | | | | | | | |
| May 1 | 23.918 | 23.939 | 23.947 | 57 | 64 | 59 | 57 | 65 | 57 | 59.7 | ..... | 51 | 59 | 53 | |
| 2 | .952 | .960 | .984 | 60 | 63 | 61 | 58 | 64 | 59 | 60.3 | ..... | 56½ | 60 | 58 | |
| 3 | .980 | .970 | .996 | 60 | 62 | 61 | 61 | 60 | 58 | 59.7 | ..... | 59½ | 59 | 58 | |
| 4 | .984 | .948 | .964 | 58 | 61 | 60 | 56 | 60 | 57 | 57.7 | ..... | 55 | 59 | 56 | Thunder at 6.50 p. m. |
| 5 | .958 | .962 | .980 | 58 | 65 | 62 | 57 | 65 | 59 | 60.3 | ..... | 57 | 58 | 56 | |
| 6 | .974 | .970 | .980 | 60 | 65 | 62 | 58 | 68 | 59 | 61.7 | ..... | 57 | 59 | 58 | |
| 7 | .982 | .970 | .980 | 57 | 64 | 62 | 55 | 66 | 60 | 60.3 | ..... | 54 | 58 | 58 | |
| 8 | .988 | .972 | .992 | 60 | 66 | 63 | 58 | 68 | 60 | 62.0 | ..... | 56 | 59 | 58 | |
| 9 | .989 | .965 | .967 | 59 | 65 | 62 | 60 | 70 | 61 | 63.7 | ..... | 56 | 60 | 58 | |
| 10 | .973 | .972 | .992 | 59 | 67 | 63 | 58 | 71 | 60 | 63.0 | ..... | 55 | 59 | 57 | |
| 11 | .996 | .994 | .990 | 61 | 65 | 59 | 62 | 66 | 56 | 61.3 | ..... | 58 | 60 | 53 | |
| 12 | .990 | .992 | .974 | 58 | 66 | 58 | 61 | 69 | 57 | 62.3 | ..... | 49 | 59 | 43½ | |
| 13 | .970 | .954 | .936 | 61 | 63 | 57 | 61 | 62 | 53 | 58.7 | ..... | 56 | 57 | 48 | |
| 14 | .938 | .936 | .952 | 60 | 63 | 60 | 61 | 64 | 59 | 61.3 | ..... | 56 | 58 | 57 | |
| 15 | .948 | .940 | .955 | 60 | 63 | 62 | 58 | 63½ | 60 | 60.5 | ..... | 56½ | 59 | 59 | |
| 16 | .972 | .942 | .978 | 61 | 63 | 62 | 58 | 62 | 59 | 59.7 | ..... | 57½ | 60 | 58 | |
| 17 | .980 | .976 | .970 | 61 | 65 | 62 | 59 | 65 | 59 | 61.0 | ..... | 58 | 59 | 59 | |
| 18 | .976 | .964 | .970 | 59 | 62 | 59 | 57 | 64 | 58 | 59.7 | ..... | 56 | 61 | 55 | |
| 19 | .970 | .976 | .972 | 57 | 64 | 57 | 57 | 66 | 54 | 59.0 | ..... | 55 | 59 | 49 | |
| 20 | .984 | .978 | .970 | 58 | 64 | 60 | 58 | 65 | 57 | 60.0 | ..... | 57 | 57 | 56 | |
| 21 | .980 | .974 | .974 | 60 | 65 | 62 | 60 | 65 | 59 | 61.3 | ..... | 57 | 59 | 58 | |
| 22 | 24.008 | .984 | .992 | 58 | 64 | 60 | 57 | 63 | 59 | 59.7 | ..... | 56½ | 60 | 57 | |
| 23 | 24.006 | .982 | 24.018 | 58 | 64 | 61 | 56 | 66 | 59 | 60.3 | ..... | 55 | 60 | 57½ | |
| 24 | 23.986 | .976 | 23.976 | 57 | 64 | 61 | 58 | 69 | 57 | 61.3 | ..... | 56 | 59 | 55 | |
| 25 | .960 | .986 | .976 | 57 | 65 | 57 | 57 | 65 | 54 | 58.7 | ..... | 53 | 57 | 45 | |
| 26 | .974 | .986 | .994 | 59 | 65 | 62 | 57 | 68 | 59 | 61.3 | ..... | 55 | 56 | 57 | |
| 27 | .994 | .996 | 24.000 | 58 | 61 | 60 | 56 | 61 | 58 | 58.3 | ..... | 55 | 58 | 57 | |
| 28 | .998 | .986 | 24.002 | 58 | 64 | 60 | 55 | 66 | 58 | 59.7 | ..... | 55 | 59 | 57 | |
| 29 | .998 | .992 | 24.000 | 56 | 61 | 60 | 56 | 62 | 58 | 58.7 | ..... | 52 | 58 | 56 | |
| 30 | .990 | .984 | 23.986 | 59 | 64 | 61 | 59 | 67 | 59 | 61.7 | ..... | 56 | 60 | 56 | |
| 31 | .980 | .950 | .974 | 59 | 64 | 60 | 57 | 68 | 59 | 61.3 | ..... | 56 | 62 | 57 | |
| Total... | 123.230 | 2.167 | 123.341 | ..... | ..... | ..... | 1798 | 2023.5 | 1801 | 1874.2 | ..... | 1722.5 | 1827 | 1722 | |
| Mean... | 23.972 | 23.970 | 23.979 | ..... | ..... | ..... | 58.0 | 65.3 | 58.1 | 60.5 | ..... | 55.6 | 58.9 | 55.5 | |
| | 23.974 | | | | | | 60.5 | | | | | 56.7 | | | |

| Day of the month. | Barometer. Height. 7 A. M. | Barometer. Height. 2 P. M. | Barometer. Height. 9 P. M. | Barometer. Thermometer attached. 7 A. M. | Barometer. Thermometer attached. 2 P. M. | Barometer. Thermometer attached. 9 P. M. | Thermometer in open air. 7 A. M. | Thermometer in open air. 2 P. M. | Thermometer in open air. 9 P. M | Thermometer in open air. Mean. | Psychrometer. Dry bulb. 7 A. M. | Psychrometer. Dry bulb. 2 P. M. | Psychrometer. Dry bulb. 9 P. M. | Psychrometer. Wet bulb. 7 A. M. | Psychrometer. Wet bulb. 2 P. M. | Psychrometer. Wet bulb. 9 P. M. | Remarks. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. | | | | ° | ° | ° | ° | ° | ° | ° | | | | ° | ° | ° | |
| June 1 | 23.970 | 23.988 | 24.010 | 59 | 59 | 58 | 58 | 57 | 58 | 57.7 | ..... | ..... | ..... | 58 | 56 | 55 | |
| 2 | 24.008 | .989 | 23.998 | 58 | 63 | 60 | 59 | 64 | 58 | 60.3 | ..... | ..... | ..... | 56 | 60 | 59 | |
| 3 | 23.974 | .966 | .964 | 57 | 64 | 60 | 59 | 64 | 59 | 60.7 | ..... | ..... | ..... | 56 | 60 | 54 | |
| 4 | .960 | .950 | .958 | 56 | 65 | 60 | 57 | 68 | 55 | 60.0 | ..... | ..... | ..... | 47 | 60 | 52½ | |
| 5 | .954 | .952 | .970 | 57 | 61 | 59 | 57 | 62 | 56 | 58.3 | ..... | ..... | ..... | 54 | 60 | 50 | |
| 6 | Barometer broken | | | | | | | | | | | | | | | | |
| Total | | | | | | | | | | 297.0 | | | | | | | |
| Mean | | | | | | | | | | 59.4 | | | | | | | |
| **CARACAS.** | | | | | | | | | | | | | | | | | |
| June 16 | | | | | | | 70 | 81 | 72 | 74.3 | | | | 65 | 69 | 69 | |
| 17 | | | | | | | 70 | 79 | 73 | 74.0 | | | | 67 | 69 | 69 | |
| 18 | | | | | | | 70 | 76 | 71 | 72.3 | | | | 68 | 70 | 68 | |
| 19 | | | | | | | 70 | 79 | 72 | 73.7 | | | | 66 | 70 | 68 | |
| 20 | | | | | | | 70 | 79 | 71 | 73.3 | | | | 67 | 71 | 69 | Thunder at 2.45 p. m.; very faint. |
| 21 | | | | | | | 69 | 76 | 71 | 72.0 | | | | 66 | 69 | 67 | |
| 22 | | | | | | | 69½ | 77 | 71 | 72.5 | | | | 67 | 70 | 68 | |
| 23 | | | | | | | 69 | 79 | 72 | 73.3 | | | | 65 | 66 | 69 | |
| 24 | | | | | | | 69 | 79 | 72 | 73.3 | | | | 65 | 67 | 69 | |
| 25 | | | | | | | 69 | 76 | 72 | 72.3 | | | | 66 | 69 | 69 | |
| 26 | | | | | | | 69 | 75 | 71 | 71.7 | | | | 67 | 68 | 68 | Thunder at 6.30 p. m.; faint. |
| 27 | | | | | | | 70 | 73 | 69 | 70.7 | | | | 67 | 69 | 67 | |
| 28 | | | | | | | 68 | 74 | 69 | 70.3 | | | | 65 | 69 | 67 | |
| 29 | | | | | | | 68 | 78 | 70 | 72.0 | | | | 66 | 66 | 67 | |
| 30 | | | | | | | 69 | 76 | 70 | 71.7 | | | | 66 | 70 | 68 | |
| Total | | | | | | | 1039.5 | 1157 | 1066 | 1067.4 | | | | 993 | 1032 | 1022 | |
| Mean | | | | | | | 69.3 | 77.1 | 71.1 | 72.5 | | | | 66.2 | 68.8 | 68.1 | |
| | | | | | | | 72.5 | | | | | | | 67.7 | | | |

No. 1.—*Register of Meteorological Observations*—Continued.

| Date. | Rain. | | Clouds. | | | | | | | | | | | | Winds (well defined.) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7 A. M. | | | | 2 P. M. | | | | 9 P. M. | | | | 7 A. M. | | 2 P. M. | | 9 P. M. | |
| | Time of beginning. | Time of ending. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Amount. | Course. | Velocity. | Kinds. | Direction. | Force. | Direction. | Force. | Direction. | Force. |
| 1858. | | | | | | | | | | | | | | | | | | | | |
| June 1 | 11.15 a. m. | 2.45 p. m. | 10 | S.SE.... | 2½ | Mid... | 10 | E.SE.... | 2½ | Mid..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW.... | 2 |
| 2 | ..... | ..... | 7 | SE..... | 2½ | ..... | 9 | SE..... | 2½ | Mid..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | | | | | E..... | 2½ | Bel. mid. | | | | | | | | | | |
| 3 | 3.55 p. m.. | 4.10 p. m.. | 1 | ..... | ..... | ..... | 9 | SE..... | 2 | ..... | 1 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S ..... | 2 |
| 4 | ..... | ..... | 8 | SW ..... | 1 | High .. | 8 | SE. .... | 2½ | Mid ..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | S.SE.. | 1 |
| 5 | 11.5 a. m.. | 11.20 a. m. | 9 | SE..... | 2 | Mid... | 9 | NW..... | 2½ | } Mid .... | 3 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | SW... | 3 |
| | 11.55 a. m. | 1.10 p. m.. | ..... | ..... | ..... | ..... | ..... | E.SE... | 2½ | | | | | | | | | | | |

CARACAS.

| | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | 3.45 p. m.. | 4.5 p. m... | 5 | S.SE.... | 3 | Mid ... | 5 | SE..... | 2 | ..... | 4 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 4.30 p. m.. | 4.45 p. m.. | ..... | E ..... | 1 | Low... | | | | | | | | | | | | | | |
| | 5.20 p. m.. | 5.55 p. m.. | | | | | | | | | | | | | | | | | | |
| 17 | ..... | ..... | 5 | E..... | 2½ | Mid.... | 7 | SE..... | 2½ | Mid..... | 9 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | E..... | 2½ | Low... | | | | | | | | | | | | | | |
| 18 | 5.15 a. m.. | 5.30 a. m.. | 10 | ..... | ..... | ..... | 7 | E..... | 2 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 1.5 p. m... | 1.30 p. m.. | | | | | | | | | | | | | | | | | | |
| | 3.40 p. m.. | 4.10 p. m.. | | | | | | | | | | | | | | | | | | |
| 19 | ..... | ..... | 4 | SE..... | 2 | ..... | 5 | ..... | ..... | ..... | 5 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | E ... ... | 3 | ..... | ..... | E ..... | 2 | ..... | ..... | E ..... | 2 | | | | | | | |
| 20 | 8 a. m..... | 8.10 a. m.. | 9 | ..... | ..... | ..... | 8 | SE..... | 1 | ..... | 10 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| | 10.5 a. m.. | 11.10 a. m. | ..... | E ..... | 2 | ..... | ..... | E..... | 2 | ..... | ..... | E ..... | 2½ | | | | | | | |
| | 2.45 p. m.. | 4.5 p. m... | | | | | | | | | | | | | | | | | | |
| 21 | ..... | ..... | 10 | ..... | ..... | ..... | 10 | ..... | ..... | ..... | 6 | Station'y | ..... | High .. | ..... | ..... | ..... | ..... | ..... | ..... |
| | | | | SE.... } E.SE.. } | 2½ | Low .. | ..... | E ..... | 2 | ..... | ..... | E ..... | 2 | Low .. | ..... | ..... | ..... | ..... | ..... | ..... |
| 22 | ..... | ..... | 10 | E ..... | 2 | Low .. | 9 | E ..... | 2 | ..... | 6 | E ..... | 2½ | Low... | ..... | ..... | ..... | ..... | ..... | ..... |
| 23 | ..... | ..... | 0 | ..... | ..... | ..... | 8 | SE..... | 2½ | ..... | 9 | E ..... | 2½ | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | ..... | ..... | 8 | SE ..... | 2 | ..... | 8 | S..... | 2 | ..... | 9 | SE..... | 2 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

| | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 25 | a. m. | 9.50 a. m., mist. | 10 | | 2 | | 10 | E. | 2 | | 10 | | | | | | | | | | |
| 26 | 6.5 p. m. | 6.10 p. m. | 9 | | | | 10 | S. | 2½ | Mid. | 10 | | | | | | | | | | |
| | 6.50 p. m. | 7.20 p. m. | | | | | | E. | 2 | Low | | | | | | | | | | | |
| 27 | 9.10 a. m. | 10.15 a. m., mist. | 10 | E. | 2 | | 10 | E | 2 | | 10 | | | | | | | | | | |
| | 5.20 p. m. | 9.30 p. m. | | | | | | | | | | | | | | | | | | | |
| 28 | 4.30 p. m. | 4.50 p. m. | 9 | ESE | 2½ | | 10 | E.SE. | 2 | | 5 | | | | | | | | | | |
| | 7.20 p. m. | 7.45 p. m. | | | | | | | | | | | | | | | | | | | |
| 29 | | | 7 | E | 2½ | | 3 | | | | 0 | | | | | | | | | | |
| 30 | 9.50 a. m. | 10.15 a. m. | 10 | E | 2½ | | 10 | | | | 9 | | | | | | | | | | |
| | 11.20 a. m. | 11.45 a. m | | | | | | | | | | | | | | | | | | | |
| | 9.15 p. m. | 9.30 p. m. | | | | | | | | | | | | | | | | | | | |
| Total | | | 116 | | | | 117 | | | | 119 | | | | | | | | | | |
| Mean | | | 7.7 | | | | 7.8 | | | | 7.5 | | | | | | | | | | |

*Half-hourly Barometrical Observations at Colonia Tovar, Venezuela.*

**The numbers marked thus * are the maxima and minima of the day.**

| Date. | 9 A. M. | Ther. | 9½ A. M. | Ther. | 10 A. M. | Ther. | 10½ A. M. | Ther. | 11 A. M. | Ther. | 3 P. M. | Ther. | 3½ P. M. | Ther. | 4 P. M. | Ther. | 4½ P. M. | Ther. | 5 P. M. | Ther. | 5½ P. M. | Ther. | Amplitude. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1858. Feb. 3 | 24.032 | 58 | 24.046 | 59 | 24.054 | 61 | *24.056 | 61 | 24.054 | 62 | 24.008 | 64 | 24.004 | 64 | *24.002 | 61 | *24.002 | 61 | 24.003 | 60 | ..... | .... | .054 |
| 4 | .058 | 55 | 060 | 55 | * .064 | 56 | .064 | 57 | .062 | 59 | .012 | 61 | .010 | 61 | .009 | 61 | * .008 | 60 | .010 | 59 | ..... | ... | .056 |
| 5 | .062 | 56 | .070 | 57 | * .072 | 57 | .070 | 57 | .070 | 57 | .016 | 60 | * .012 | 60 | .014 | 60 | * .012 | 60 | .016 | 59 | ..... | .... | .060 |
| 6 | .048 | 56 | .054 | 59 | * .060 | 59 | .059 | 60 | .050 | 61 | .003 | 62 | 23.998 | 61 | 23.997 | 61 | 23.994 | 61 | *23.992 | 60 | 23.994 | 59 | .068 |
| 7 | .022 | 59 | .029 | 60 | * .031 | 61 | .031 | 62 | .030 | 62 | *23.972 | 61 | * .972 | 61 | .975 | 61 | .974 | 60 | .974 | 59 | 23.976 | 59 | .059 |
| 8 | .008 | 59 | .018 | 62 | .022 | 64 | * .024 | 64 | .020 | 64 | .960 | 62 | * .957 | 62 | .958 | 62 | .959 | 61 | .960 | 60 | ..... | .... | .067 |
| 9 | .020 | 61 | .028 | 63 | .030 | 64 | * .031 | 64 | .026 | 64 | .980 | 64 | * .972 | 64 | .974 | 63 | .974 | 62 | .976 | 62 | ..... | .... | .059 |
| Total .. | ..... | .. | ..... | .. | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | .423 |
| Mean... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | .... | ..... | ... | ..... | .... | ..... | ... | ..... | .... | ..... | .... | .0604 |

# METEOROLOGY.

## E CLIMATE OF SACRAMENTO, CALIFORNIA, BY THOMAS M. LOGAN, M. D.

**Latitude 38° 34′ 41″ N. Longitude 121° 27′ 44″ W.**

As supplementary to the abstract of meteorological observations for 3, 1854, and 1855, published in the reports of the Smithsonian titution, the accompanying tables for 1856–'57, together with the ılts of the aggregate five years, have been prepared.

t may not meet the exactions of a rigid science to deduce a positive w of the climate from a series of observations extending through y five years, still an approximation may now be arrived at that l be sufficiently near to afford a very just appreciation of some of climatic features of this portion of the great valley of the Sacraato, due allowance being made for irregularities and disturbing ses. Owing chiefly to the difficulty of procuring reliable instruıts and proper tables and instructions, the records, which were le in various forms and with differing calculations, required reangement and tabulation to render them comparable with each er. These considerations will be a sufficient apology with those o have much experience in arranging statistical tables for a certain ount of inaccuracy which has crept into our former publications. the present instance we have used every possible precaution while tifying former errors,* which are herewith specified, that the advanes already received may be rendered more valuable hereafter.

### BAROMETER.

The series of barometric observations have not been, in one respect, tinuous. Had they been conducted with one and the same instruıt doubtless some valuable deductions might have been gathered n their analysis; as it is we can only note some of the most obvious ılts. During 1853 the ordinary ship barometer, (the only one to had then,) which was used, appears to have ranged entirely too . The readings from this instrument, as well as those which were istered from a common open cistern, and a siphon of Gay Lussac,

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*Errata in former publications.*—The latitude and longitude of Sacramento are correctly n above, and are erroneous in the previous reports.

53.—*Bar.* Mean for January, for 29.65 read 29.75; annual mean, for 30.01 read 30.02 es *Therm.* Mean maximum, for 80°.40 read 80°.04; mean minimum, for 49°.00 read 08; mean for October, for 78°.00 read 73°.00. *Winds.* SE., total, for 101 read 111.

54.—*Bar.* Mean of January, for 29.11 read 30.11; minimum of May, for 29.00 read 0; mean minimum, for 29.76 read 29.81; annual mean, for 29.98 read 30.07 inches. *rm.* Mean maximum, for 79°.54 read 79°.29; mean minimum, for 42°.72 read 42.73 *ıy days.* March, for 9 read 4. *Inches of rain,* for 8.25 read 3.25. Annual total of *clear* , for 223 read 228. Total *rainy days,* for 60 read 55.

55.—*Bar.* Maximum of July, for 29.85 read 30.15; mean maximum, for 30.09 read 30.14 es. *Dew point.* Annual mean, for 47°.52 read 46°.69.

were never corrected for temperature. During 1856 and 1857 Green's Smithsonian barometer was employed, and its readings reduced to 32° Fahrenheit. No correction for altitude was ever made, as the cisterns of the various instruments employed were at so small an elevation above the level of the sea. Neither was the elastic force of vapor applied at the time of the record. This force has been calculated only during the past year, according to the rules established by Regnault for deriving every degree of it exhibited in the atmosphere from the readings of the wet and dry-bulb thermometers. It will be seen that it increases directly with the temperature, and amounted during 1857 to nearly half an inch during midsummer, or one sixty-seventh of the entire atmospheric weight.

The absence of either abrupt or great changes gives indication of the tropical feature which the climate possesses. As a general rule the atmospheric pressure varies but little, and that through slow and long continued movements, rather than in the sudden manner characteristic of the latitude on the Atlantic coast and elsewhere. Nevertheless, although the mercurial column rises and falls within very restricted limits, yet there are changes, represented it is true by small measurements, which occur with wonderful regularity and certainty, diurnal movements at fixed hours, as well as annual ones, having reference to the position of the sun in the ecliptic. The former, or horary oscillations, as revealed on the chart of diurnal barometrical curves, present, in a marked degree, the two diurnal maxima and minima observed within the tropics; the ante-meridian maximum, at about 9 to 10 a. m., being more constant than that at the same period post meridian. Without a single exception the pressure is always less at 3 p. m., and this has no reference to whether the column stands high, as in the cold, or low, as in the hot season.

The following table, calculated from the horary observations, taken once a month during 1857, gives the mean successive hourly range for the year. The signs + and — denote the range of each hour above or below the mean of the twenty-four hours.

Table of successive hourly changes of barometer for 1861.

| Hours. | January 22. | February 23. | March 22. | April 29. | May 29. | June 22. | July 22. | August 28. | September 23 | October 21. | November 27. | December 23. | Mean. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 a. m..... | + .044 | + .134 | − .064 | + .098 | − .008 | + .052 | + .028 | − .024 | + .057 | + .080 | + .066 | + .117 | ..... |
| 8 a. m..... | .041 | .125 | .057 | .098 | .016 | .042 | .036 | .024 | .061 | .095 | .044 | .117 | ..... |
| 9 a. m ..... | .041 | .114 | .032 | .103 | .012 | .038 | .042 | .032 | .075 | .092 | .053 | .122 | ..... |
| 10 a. m..... | .036 | .081 | .026 | .101 | .008 | .048 | .044 | .014 | .078 | .084 | .065 | .127 | ..... |
| 11 a. m..... | .031 | .058 | .018 | .083 | .010 | .048 | .039 | .002 | .067 | .079 | .038 | .107 | ..... |
| 12 m. ..... | .028 | .028 | .043 | .053 | .040 | .041 | .037 | .017 | .052 | .062 | .025 | .078 | ..... |
| 1 p. m..... | + .015 | .024 | .049 | + .031 | .037 | .018 | + .020 | .018 | .031 | .037 | .014 | .047 | ..... |
| 2 p. m..... | − .029 | .018 | .046 | − .010 | .040 | + .014 | − .008 | .038 | + .009 | + .008 | .006 | .029 | ..... |
| 3 p. m.... | .033 | + .012 | .046 | .022 | .052 | − .007 | .014 | .038 | − .007 | .000 | .004 | + .004 | ..... |
| 4 p. m..... | .053 | − .005 | .043 | .047 | .059 | .019 | .012 | .046 | .025 | − .024 | + .006 | − .002 | ..... |
| 5 p. m..... | .029 | .005 | .040 | .135 | .056 | .031 | .031 | .050 | .032 | .030 | − .003 | .017 | ..... |
| 6 p. m..... | .031 | .010 | .008 | .054 | .035 | .019 | .046 | .056 | .032 | .030 | + .013 | .021 | ..... |
| 7 p m..... | .028 | .007 | .040 | .060 | .026 | .046 | .038 | .033 | .053 | .018 | .016 | .027 | ..... |
| 8 p. m..... | .026 | .006 | − .008 | .048 | − .024 | .058 | .017 | .018 | .035 | .039 | .002 | − .036 | ..... |
| 9 p. m..... | .023 | .022 | + .015 | .040 | + .002 | .037 | .010 | − .005 | .024 | .036 | + .004 | + .037 | ..... |
| 10 p. m..... | − .047 | .022 | .040 | .019 | .040 | .027 | .010 | + .030 | .022 | .045 | − .005 | − .039 | ..... |
| 11 p. m..... | + .002 | .042 | .046 | .011 | .043 | − .016 | .007 | .023 | .019 | .038 | .005 | .042 | ..... |
| 12 p. m..... | .002 | .042 | .052 | .030 | .045 | + .012 | .009 | .026 | .021 | .032 | .009 | .051 | ..... |
| 1 a. m..... | .005 | .051 | .057 | .027 | .048 | .015 | .012 | .028 | .016 | .030 | .019 | .064 | ..... |
| 2 a. m..... | .005 | .053 | .064 | .025 | .051 | + .007 | .013 | .031 | .013 | .034 | .032 | .066 | ..... |
| 3 a. m..... | .010 | .062 | .067 | .022 | .053 | − .005 | .013 | .030 | .020 | .040 | .046 | .074 | ..... |
| 4 a. m..... | .013 | .083 | .072 | .019 | .051 | .012 | .011 | .065 | .033 | .035 | .066 | .074 | ..... |
| 5 a. m..... | .015 | .087 | .072 | .019 | .043 | .024 | .019 | .086 | .045 | .052 | .086 | .091 | ..... |
| 6 a. m..... | + .013 | − .097 | + .073 | − .022 | + .034 | − .028 | − .000 | + .108 | − .026 | − .046 | − .086 | − 106 | ..... |
| Sums..... | 600 | 1186 | 1078 | 1084 | 833 | 664 | 516 | 842 | 853 | 1066 | 703 | 1495 | ..... |
| Means..... | .025 | .049 | .045 | .045 | .035 | .028 | .022 | .035 | .036 | .044 | .029 | .062 | .038 |

The mean successive daily range frequently, in summer, does not amount to more than the ninety-four thousandth part of an inch. The following calculation from the readings of the Smithsonian barometer during the last two years substantiates this fact.

| Barometer. | Jan. | Feb. | Mar. | April. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mean, 1856..... | .130 | .114 | .116 | .114 | .056 | .091 | .066 | .070 | .078 | .088 | .103 | [illegible] |
| Mean, 1857..... | .110 | .126 | .101 | .071 | .109 | .062 | .046 | .059 | .057 | .075 | .110 | [illegible] |
| Mean for 2 years..... | .120 | .120 | .109 | .093 | .083 | .097 | .056 | .065 | .068 | .082 | .107 | [illegible] |

The mean difference of the successive months above or below the annual average of the five years, as can readily be calculated from the data furnished, does not amount to more than one-sixteenth of an inch. Between the highest mean mensual mean and the lowest a fraction over one-fifth of an inch is found. The extreme ranges observed during the month are also limited, as may be seen in the subjoined table for 1857, wherein is also revealed the annual tide shown in the chart of curves; gradually descending as the sun approaches the northern tropic, and ascending as he returns towards the southern.*

| | | | |
|---|---|---|---|
| January..... | 0.633 | July..... | 0.349 |
| February..... | 0.713 | August..... | 0.401 |
| March..... | 0.571 | September..... | 0.411 |
| April..... | 0.427 | October..... | 0.536 |
| May..... | 0.433 | November..... | 0.590 |
| June..... | 0.404 | December..... | 0.641 |

The extreme annual ranges are also small. During 1853 the maximum height of the barometer occurred in November and December, and read 28.980, giving the difference as the extreme annual range of 1.460 inch. This, however, is the result of an extreme minimum, never before nor since observed. A more reliable and the next lowest minimum was 29.380 inches, observed with Gay Lussac's siphon barometer on the morning, 1st January, 1855, before daylight, during a strong gale from the SE. The greatest mensual range was also observed in the same month, the maximum for the year having reached 30.410 inches in the same month, and giving a difference of 1.030 inch for the month as well as for the year The lowest reading for the same year was 29.569 inches on the 19th September. The extreme annual range was therefore 1.050 inch. These instances of extreme range are very rare, and must be regarded as exceptional. The extreme range for 1854 was only 0.850, and that of 1857 but 0.783 inch. During the rainy season northerly winds always determine the greatest elevation, and southerly the greatest depression of the mercurial column. This rule is not so constant during the dry season.

* The mean for July of the series is higher than that of June, in consequence of some peculiar disturbing causes in June, 1853, which year should be regarded as exceptional, and which may in part be attributable to a defective instrument.

. annual atmospheric pressure is put down at 30.006 s has been obtained from the mensual means derived from ıily readings. The diurnal mean calculated from the vations presents the following differences, which, if ap- give the absolute mean for each month.

| Date. | BAROMETER. | | |
|---|---|---|---|
| | Daily mean. | Hourly mean. | Difference. |
| 1857. | | | |
| y 22 | 30.233 | 30.237 | +0.004 |
| ry 23 | 30.018 | 29.976 | —0.042 |
| 23 | 30.139 | 30.172 | +0.033 |
| 9 | 29.948 | 29.932 | —0.016 |
| ; | 30.007 | 30.031 | +0.024 |
| 2 | 29.889 | 29.879 | —0.010 |
| ; | 29.856 | 29.855 | —0.001 |
| ; 28 | 29.905 | 29.927 | +0.022 |
| ıber 23 | 29.922 | 29.908 | —0.014 |
| r 21 | 29.986 | 29.969 | —0.017 |
| ber 27 | 30.225 | 30.203 | —0.022 |
| ber 23 | 30.155 | 30.120 | —0.035 |
| ean difference | | | 0.020 |

observed, on referring to the diurnal as well as annual while each curve varies there is still, due allowance being ıturbing causes, a very apparent similarity, the evidence ılar moving influence, going and coming, present at one ut at another, and returning again, and so on. These bear the closest analogy with those observed at Algiers, ther localities on the southern shores of the Mediterranean, ıd by A. Mitchell, A. M., M. D.*

THERMOMETER.

ɔarometer the thermometer reveals also some features of a ıer than the temperate climate, to which latitudinally Sac- ıertains. The mean monthly and annual temperatures, ıe accompanying tables, are calculated, like those of the rom the daily observations made at 7 a. m., 2 p. m., and ıis arithmetical mean is found to differ occasionally from d from the thermometrograph during the last two years. ım temperature, as seen from the curves projected in the rly observations, occurs between 4 and 5 a. m., and the bout 3 p. m. Consequently the mean deduced from the erally minus that of the former. The following table rrection to be applied in order to obtain the absolute mean:

itish and Foreign Medico-Chirurgical Review, No. XXXIII, 1856.

| Date. | THERMOMETER. | | |
|---|---|---|---|
| | Daily mean. | Hourly mean. | Difference. |
| 1857. | | | |
| January 22 | 48.00 | 48.50 | +0.50 |
| February 23 | 54.00 | 53.75 | —0.25 |
| March 23 | 52.00 | 50.38 | —1.62 |
| April 29 | 62.66 | 61.88 | —0.78 |
| May 22 | 63.66 | 62.46 | —1.20 |
| June 22 | 70.66 | 69.83 | —0.83 |
| July 22 | 77.00 | 75.23 | —1.77 |
| August 28 | 66.33 | 65.21 | —1.12 |
| September 23 | 64.00 | 64.08 | +0.08 |
| October 21 | 59.00 | 58.50 | —0.50 |
| November 27 | 52.66 | 53.58 | +0.92 |
| December 23 | 43.33 | 43.50 | +0.17 |
| Sum | | | 9.74 |
| Mean | | | 0.81 |

As this correction is deduced from the difference between the observations of a single isolated day in each month of the year, due caution and allowance for variation of seasons and other disturbing causes must be exercised. For this reason we have not applied the correction to our tables, but purpose prosecuting the series of hourly observations; and with a view to uniformity hereafter will adopt the term *days*, commencing at 10 p. m.*s* mean time, Gottingen, on the Friday preceding the last Saturdays of February, May, August, and November, and on the Wednesdays nearest the 21st of each of the other months. Another and most important object in this connexion will be the determination of the hours of mean temperature. As will be seen in the table subjoined, the measures of the critical interval are so from corresponding with the quantity obtained in all other localities, and which are generally so near as to amount almost to a constant, that the two times of the day at which the mean temperature occurs can only be regarded as approximative. January affords a solitary instance of the daily mean temperature occurring after midnight, viz: 12*h*. 30*m*. p. m.

*: of the Hours of Mean Temperature and the "critical interval" between those hours.*

| Date. | Daily mean. | Morning hour. | | Evening hour. | | Critical interval. | |
|---|---|---|---|---|---|---|---|
| 1857. | | *h.* | *m.* | *h.* | *m.* | *h.* | *m.* |
| y 22 | 48.50 | 11 | 30 | 12 | 30 | 13 | 00 |
| ıry 23 | 53.75 | 10 | 45 | 10 | 15 | 11 | 30 |
| 22 | 50.38 | 8 | 41 | 9 | 19 | 12 | 38 |
| !9 | 61.88 | 9 | 53 | 9 | 7 | 11 | 14 |
| 2 | 62.46 | 7 | 30 | 8 | 16 | 12 | 46 |
| 2 | 69.83 | 7 | 33 | 8 | 6 | 12 | 33 |
| 2 | 75.63 | 8 | 54 | 8 | 41 | 11 | 47 |
| t 28 | 65.21 | 7 | 36 | 8 | 47 | 13 | 11 |
| ıber 23 | 64.03 | 8 | 42 | 9 | 55 | 13 | 13 |
| r 21 | 58.50 | 9 | 38 | 9 | 15 | 11 | 37 |
| ıber 27 | 53.58 | 10 | 47 | 12 | 35 | 13 | 48 |
| ber 23 | 43.50 | 10 | 45 | 9 | 30 | 10 | 45 |
| n | | | | | | 12 | 20 |

e of the most striking features of the climate, seen on the accom- ing chart of diurnal variations, is the greatest reduction of tem- ıre after the hour of maximum elevation. Howsoever high the of temperature towers up under the influence of a vertical sun cloudless sky, it sinks proportionately low during the night, ering it cool and chilly. As an instance of the reliability and om from exaggeration of the curves of temperature in this respect, ould remark that the record of the thermometrograph for July, , reveals a range of 41 degrees, and a mean daily range of 18.68 ees, while the chart of diurnal observations describes a curve of 24 degrees. The following table exhibits the successive hourly es during one day of each month in the year.

*Table of successive Hourly Ranges of the Thermometer for* 1857.

| Hours. | January 22. | February 23. | March 22. | April 29. | May 22. | June 22. | July 22. | August 28. | September 23. | October 21. | November 27. | December 23. | Mean. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 a. m. | — 4.50 | — 4.75 | — 2.38 | — 6.88 | — 1.46 | — 2.83 | — 6.23 | — 1.21 | — 4.08 | — 3.50 | — 5.58 | — 5.50 | ..... |
| 8 a. m. | — 3.50 | — 4.75 | — 1.38 | — 4.88 | 1.54 | 2.17 | — 3.23 | 0.79 | — 2.08 | — 2.50 | — 5.58 | — 5.50 | ..... |
| 9 a. m. | — 2.50 | — 3.75 | 0.62 | — 0.88 | 3.54 | 6.17 | 0.77 | 2.79 | 0.92 | — 2.50 | — 3.58 | — 3.50 | ..... |
| 10 a. m. | — 2.50 | — 0.75 | 2.62 | 1.12 | 6.54 | 8.17 | 4.77 | 4.79 | 1.92 | 1.50 | — 1.58 | — 1.50 | ..... |
| 11 a. m. | — 0.50 | 0.25 | 3.62 | 2.12 | 7.54 | 8.17 | 7.77 | 5.79 | 2.92 | 1.50 | 0.42 | 0.50 | ..... |
| 12 m. | 0.50 | 3.25 | 4.62 | 4.12 | 6.54 | 7.17 | 8.77 | 5.79 | 2.92 | 4.50 | 1.42 | 2.50 | ..... |
| 1 p. m. | 1.50 | 4.25 | 5.62 | 5.12 | 5.54 | 6.17 | 9.77 | 4.79 | 2.92 | 5.50 | 2.42 | 4.50 | ..... |
| 2 p. m. | 2.50 | 5.25 | 5.62 | 9.12 | 6.54 | 6.17 | 11.77 | 4.79 | 2.92 | 4.50 | 2.42 | 4.50 | ..... |
| 3 p. m. | 4.50 | 4.25 | 5.62 | 10.12 | 6.54 | 5.17 | 12.77 | 4.79 | 3.92 | 4.50 | 3.42 | 5.50 | ..... |
| 4 p. m. | 4.50 | 4.25 | 5.62 | 10.12 | 5.54 | 4.17 | 9.77 | 4.79 | 4.92 | 4.50 | 2.42 | 4.50 | ..... |
| 5 p. m. | 3.50 | 3.25 | 5.62 | 7.12 | 4.54 | 5.17 | 6.77 | 4.79 | 3.92 | 4.50 | 2.42 | 3.50 | ..... |
| 6 p. m. | 2.50 | 2.25 | 4.62 | 5.12 | 4.54 | 5.17 | 4.77 | 4.79 | 3.92 | 3.50 | 1.42 | 3.50 | ..... |
| 7 p. m. | 2.50 | 1.25 | 3.62 | 4.12 | 1.54 | 3.17 | 4.77 | 2.79 | 3.92 | 2.50 | 1.42 | 2.50 | ..... |
| 8 p. m. | 1.50 | 0.25 | 2.62 | 3.12 | 0.54 | 0.17 | 1.77 | 0.79 | 2.92 | 2.50 | 0.42 | 1.50 | ..... |
| 9 p. m. | 1.50 | 0.25 | 1.62 | 0.12 | — 1.46 | — 1.83 | — 0.23 | — 0.21 | 0.92 | 0.50 | 0.42 | 0.50 | ..... |
| 10 p. m. | 1.50 | 0.25 | — 0.38 | — 0.88 | — 4.46 | — 1.83 | — 2.83 | — 2.21 | — 0.08 | — 1.50 | 0.42 | — 0.50 | ..... |
| 11 p. m. | 1.50 | — 0.75 | — 2.38 | — 3.88 | — 5.46 | — 3.83 | — 4.23 | — 3.21 | — 1.08 | — 2.50 | 0.42 | — 2.50 | ..... |
| 12 p. m. | 0.50 | — 0.75 | — 3.38 | — 3.88 | — 6.46 | — 6.83 | — 4.23 | — 4.21 | — 1.08 | — 3.50 | 0.42 | — 3.50 | ..... |
| 1 a. m. | — 0.50 | — 0.75 | — 4.38 | — 4.88 | — 7.46 | — 7.83 | — 6.23 | — 5.21 | — 3.08 | — 3.50 | — 0.58 | — 2.50 | ..... |
| 2 a. m. | — 0.50 | — 1.75 | — 6.38 | — 5.88 | — 8.46 | — 8.83 | — 8.23 | — 6.21 | — 4.08 | — 3.50 | — 0.58 | — 1.50 | ..... |
| 3 a. m. | — 2.50 | — 1.75 | — 7.38 | — 6.88 | — 9.46 | — 8.83 | — 10.23 | — 7.21 | — 5.08 | — 3.50 | — 0.58 | — 1.50 | ..... |
| 4 a. m. | — 3.50 | — 2.75 | — 8.38 | — 7.88 | — 8.46 | — 9.83 | — 11.23 | — 8.21 | — 5.08 | — 5.50 | — 0.58 | — 2.50 | ..... |
| 5 a. m. | — 4.50 | — 2.75 | — 8.38 | — 7.88 | — 5.46 | — 9.83 | — 8.23 | — 8.21 | — 6.08 | — 4.50 | — 0.58 | — 1.50 | ..... |
| 6 a. m. | — 3.50 | — 3.75 | — 7.38 | — 6.88 | — 2.46 | — 5.83 | — 10.23 | — 6.21 | — 7.08 | — 3.50 | — 0.58 | — 1.50 | ..... |
| Sums | 57.00 | 58.00 | 104.24 | 123.00 | 122.08 | 135.34 | 159.00 | 104.60 | 77.84 | 80.00 | 39.68 | 67.00 | ..... |
| Means | 2.38 | 2.42 | 4.34 | 5.13 | 5.09 | 5.64 | 6.63 | 4.36 | 3.24 | 3.33 | 1.65 | 2.79 | 2.92 |

The mean daily range for each month is exhibited in the subjoined ›le, which embodies the two last years' observations with the ther- ›metrograph.

| For 1856-'57. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Annual. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| n of all highest readings by day. | 51.32 | 57.38 | 63.56 | 68.22 | 71.30 | 79.20 | 78.95 | 81.03 | 78.99 | 67.75 | 59.41 | 50.64 | 67.29 |
| n of all lowest readings by night | 39.81 | 43.72 | 47.91 | 50.01 | 53.35 | 58.88 | 58.88 | 64.69 | 55.45 | 49.86 | 43.64 | 37.80 | 50.33 |
| n daily mensual range..... | 11.51 | 13.66 | 15.65 | 18.21 | 17.95 | 20.32 | 22.07 | 16.34 | 23.54 | 17.89 | 15.77 | 12.84 | 16.96 |

Dividing the year into its meteorological seasons, the mean daily ıge will be as follows:

ring, (February, March and April)..... 15°.84
mmer, (May, June, July, August, and September)..... 19°.64
tumn, (October and November)..... 16°.83
inter, (December and January)..... 12°.18

Reverting to the table of monthly and annual means we find the pective mean temperature of the seasons to be as follows: For the ing months, mean 55°.31, the mean maximum being 71°.20, and the an minimum 42°.13; for the summer, mean 70°.19, and the mean xima and minima 92°.50 and 55°.11, respectively; for the autumn, an 58°.47, and mean maxima and minima 78°.20 and 44.°00, re- ›ctively; in the two winter months the mean is 45°.94, the mean xima 0°.90, and the mean minima 29°.70.

Thus it is demonstrated that there is a mean difference between ıter and spring of 9°.35; between spring and summer of 14°.88; ›ween summer and autumn of 11°.72; and between autumn and ıter of 12°.53. The difference of the means of the hottest and dest months between summer and winter is also shown to be °.25, and the extreme variation, or the difference between the mean xima of the former and the mean minima of the latter, 41°.50.

It will be noticed that in our division of the seasons we have, in ›ordance with the phenomena observed, defined February as the ıt of the three spring months, and appropriated five months to mmer, and only two to autumn, and two to winter. Indeed, the rmant season is of so short duration that the tropical division into › wet and dry seasons would perhaps be more appropriate. The ıole period of sensible winter is far from being a complete season of ›pension of vegetation. During the period we have assigned to it ıny forms of vegetable life are still active; particularly the roots of asses and winter grains. The lowest mean daily temperature longing to this period is seldom below 40°. Although the ther- ›meter has been known to fall as low as 33° as late as the 10th of bruary, still the leafing process generally commences during the st week of February and is completed at a temperature not much

exceeding that of the mean annual. Sometimes a greater degree of cold is experienced in March than in February, and at other times spring is as well advanced in March as at other seasons it is in May. In 1855 the mean temperature of May was 3° lower than that of April, 1857, notwithstanding, the distribution of heat for the three months of spring is marked by no great variability in successive years, nor great constant differences of the months. The measure of heat increases very gradually from month to month. Indeed, the same uniformity of temperature is found to obtain throughout all the meteorological seasons. In summer the greatest vicissitudes of temperature are found to occur, as is readily seen in the subjoined table for 1856 and 1857. The commencement of autumn is quite similar to the beginning of spring in its mean of daily temperature. The earth remaining warmer than the atmosphere under the decline of temperature, activity is partially renewed after the drought of summer by the influence of the light early showers of October. The first frosts occur about the middle of November, and the decline into winter is prolonged until the latter part of December. Ice is seldom formed before the beginning of January, and then rarely remains unthawed for 24 consecutive hours. As a physical constant it is a matter of some difficulty to place within 5° of different latitudes isothermal lines for the seasons. That of 60° for the spring, designed for the United States Army Meteorological Register, which connects Sacramento with Beaufort, North Carolina, on the Atlantic coast, and San Diego, on the Pacific, curves 5° 52′ latitude to the south on arriving at the latter point. A corresponding divergence to the north occurs during the winter. The isochimenal line of 45°, which is common to Beaufort, North Carolina, and Sacramento, describes a northerly curve of 8° 03′ latitude before reaching the Pacific at Port Orford, Oregon, latitude 42° 44′; the mean annual temperature of which place is only 53° 6′. The isotheral of 70°, starting from latitude 40° on the Atlantic side, comes out on the Pacific coast on the parallel of 30°. The great curvature to the south on the Pacific coast during spring and summer demonstrates one of the peculiarities of the distribution of heat in this region. For the mean of the three months of spring the sea temperature which predominates on the line of coast westward of the coast range of mountains is strikingly uniform, and shows but little, if any, advance on that of winter. Indeed, the same may be said of the summer months. For some hundreds of miles on the 40th parallel there is very little difference in the sea temperature for the entire year, and the cold of the Pacific in summer extends, according to the Army Register, from the 50th to the 30th parallel. Thus while the extremes of summer heat are common to the whole valley of the Sacramento and San Joaquin, the mean summer temperature of San Francisco is only 60°, and there is only one day recorded among the observations of Dr. Henry Gibbons when the temperature rose above 79° during the summer months.

## 1856.

| SPRING. | | | | | | SUMMER. | | | | | | AUTUMN. | | | | | | WINTER | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date. | Daily mean. | Vicissitude. | Winds. 7. | 2. | 9. | Date. | Daily mean. | Vicissitude. | Winds. 7. | 2. | 9. | Date. | Daily mean. | Vicissitude. | Winds. 7. | 2. | 9. | Date. | Daily mean. | Vicissitude. | Winds. 7. | 2. | 9. |
| Feb. 26 | 53.67 | 5.34 | NW. | NW. | W... | May 3 | 57.67 | 10.66 | NW. | NW. | S.... | Oct. 28 | 59.00 | 8.00 | NW. | N... | N... | Dec. 22 | 41.38 | 9.67 | NE. | SE. | SE. |
| 27 | 48.33 | | NW. | NW. | NW. | 4 | 68.33 | | S.... | SW. | SW. | 29 | 67.00 | | N... | NW. | NW. | 23 | 51.00 | | NE. | SE. | SW. |
| Mar. 8 | 54.33 | 7.34 | N... | N... | SW. | June 13 | 79.00 | 8.67 | E... | S.... | S.... | Nov. 2 | 68.00 | 9.67 | NW. | NW. | NW. | Jan. 6 | 46.67 | 8.00 | N... | NW. | N... |
| 9 | 61.67 | | NW. | NW. | NW. | 14 | 70.33 | | S.... | S.... | S.... | 3 | 58.38 | | N... | SE. | SE. | 7 | 38.67 | | N... | NW. | N... |
| April 3 | 56.67 | 5.00 | W... | SW. | S.... | July 11 | 81.67 | 9.34 | SE. | S.... | S.... | | | | | | | | | | | | |
| 4 | 61.67 | | S.... | SW. | SW. | 12 | 72.33 | | SW. | S.... | S.... | | | | | | | | | | | | |
| | | | | | | Aug. 5 | 70.67 | 8.66 | S.... | S.... | S.... | | | | | | | | | | | | |
| | | | | | | 6 | 79.33 | | S.... | NW. | SW. | | | | | | | | | | | | |
| | | | | | | Sept. 22 | 67.00 | 10.67 | SE. | W... | SE. | | | | | | | | | | | | |
| | | | | | | 23 | 77.67 | | N... | N... | NW. | | | | | | | | | | | | |

## 1857.

| | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Feb. 5 | 48.33 | 7.33 | SE. | W... | S.... | May 23 | 68.33 | 8.34 | N... | NW. | N.... | Oct. 16 | 68.00 | 6.00 | N... | N... | SW. | Dec. 6 | 49.00 | 5.33 | SW. | NW. | NW. |
| 6 | 41.00 | | NW. | NW. | NW. | 24 | 76.67 | | S.... | NW. | NW. | 17 | 62.00 | | SE. | W... | SW. | 7 | 43.67 | | N... | NE. | N... |
| Mar. 19 | 57.67 | 5.67 | SW. | NW. | NW. | June 17 | 87.00 | 8.67 | NW. | NW. | SW. | Nov. 5 | 62.67 | 7.00 | SE. | SW. | SW. | | | | | | |
| 20 | 52.00 | | W... | SW. | S... | 18 | 78.33 | | SE. | SE. | SE. | 6 | 55.67 | | E... | N... | NW. | | | | | | |
| April 23 | 68.67 | 6.34 | E... | N... | S.... | July 15 | 70.67 | 7.33 | SE. | S.... | SE. | | | | | | | | | | | | |
| 24 | 62.33 | | S.... | SW. | SW. | 16 | 78.00 | | N... | N... | SW. | | | | | | | | | | | | |
| | | | | | | Aug. 7 | 78.67 | 6.33 | SE. | SW. | SW. | | | | | | | | | | | | |
| | | | | | | 8 | 80.00 | | SE. | NW. | SW. | | | | | | | | | | | | |
| | | | | | | Sept. 14 | 73.00 | 7.33 | N... | N... | S.... | | | | | | | | | | | | |
| | | | | | | 15 | 65.67 | | NE. | N... | SE. | | | | | | | | | | | | |

*Hygrometry, Wind, Hail, Snow, Electrical and other Phenomena.*

An examination of the results of the psychrometer will reveal the peculiar state of the atmosphere during the summer months. So great is the apparent aridity at times that the lower ærial strata are frequently found to contain during the hottest part of the day not more than 15 to 20 per centage of their capacity for moisture. As an isolated and extreme case, on the 10th July, 1856, at 2 p. m., wind N. and light, and temperature 100°, the dew-point was found at 22°. This, we believe, is the greatest dryness that has yet been observed on the surface of the globe on low lands. Humboldt, in his Cosmos, states that the greatest dryness he has observed was in the steppe of Platowskaja, after a SW. wind had blown for a long time from the interior of the continent. With a temperature of 74°.07 he found the dew-point at 24°, the air containing $\frac{16}{100}$ths of aqueous vapor. The principal agent in this hygrometric peculiarity of the climate is to be found in the direct effect of northerly winds. In the winter and spring the north winds are the coldest and serve, as the land is then cooler than the sea, on account of the distance of the sun, to condense the moisture wafted with the atmospherical current from the southern hemisphere, and to precipitate it in the form of rain. During this season the southeast trades, charged to their utmost capacity with moisture, commence descending as their temperature decreases, and precipitate more and more rain as they become chilled by the north winds. During the summer, owing to the fact of these northerly winds passing over a highly heated and arid surface, their temperature is raised, thereby increasing their capacity for moisture, which not being able to obtain from the surface passed over, they appear as dry winds, reminding one of the reputed sirocco of Italy. Nevertheless, dry as these winds apparently are, on coming in contact with the westerly winds chilled by the oceanic polar current along the coast, and their temperature being again reduced, the vapor they contain is rapidly condensed; hence the heavy mists that are precipitated during the afternoon at San Francisco and at the gaps along the coast. In the valley, as a general rule, the direction of the wind is from north by west to southeast. It seldom blows from the east or northeast with any appreciable force. Doubtless the prevailing wind off the coast, where no causes of local deflection exist, is west, as established by Lieut. Maury. This wind, rushing into the heated valleys through the gap at San Francisco and Benicia, reaches us at Sacramento and the northern part of the valley as a southwest wind, while at Stockton and the San Joaquin valley it is a westerly and northwesterly wind. To this wind, together with that descending from the slopes of the sierras, may be attributed our cool summer nights.

The influence of the winds on the temperature, as we have just seen with respect to the hygrometric condition of the air, varies according to the season of the year. It is during the occurrence of northerly winds in the summer that we experience our hottest weather, which seldom lasts long, however, before the temperature becomes equalized by a change of wind to the southward. Upon an examination of our daily and hourly records we find it to be a common occurrence during

the summer months for the wind to commence blowing from the north at or shortly after the morning observation, and to remain in this quarter until afternoon, when it would change round to the south, freighted with moisture and invigorating freshness. It is the prevalence of these cool winds which temper our summer climate so delightfully, the greater or less predominance of which renders the mean temperature plus or minus.

As regards the *force* of the wind, it is generally but slight. The observations in this respect having been registered for the two last years only it is impossible to make full deductions therefrom with any degree of completeness. The following enumeration of the frequency, course, and seasons of winds, during 1856 and 1857, stronger than (3) a fresh breeze, will afford some idea of this feature of the climate.

The whole number of times it blew with the force of four, (4,) or what is estimated a strong wind, from the north, was 29, viz: January, three times; February, five times; March, once; April, four times; June, once; September, three times; October, twice; November, eight times; and December, twice Eighteen times it blew from the south with the force of four, (4,) viz: January, once; August, twice; September, four times; October, three times; November, four times; and December, four times. It blew only eight times with the force of (5) a high wind, viz: three times from the north, once in February, once in April, and once in November; and again five times from the south, viz: once in January, once in October, once in November, and twice in December. But twice does it appear in the register to have blown a gale, (6,) and on both these occasions it was from the southeast, in the month of November. These results, as before stated, are derived from the record of the last two years. Prior to this no precise estimate was made of the force of the wind. The only time it was ever observed during the whole series of five years to blow with a force above six was on the last night of the year 1854, or rather on the morning of the 1st of January, 1855, when a strong gale from the southeast, attended with rain, was experienced. As a general rule, it very rarely rains with the wind from the northern half of the octant, which may be attributed to its coming to a warmer from a colder region. During the last five years there have occurred only fifteen exceptions to this rule, and the aggregate quantity that fell at these different periods does not amount to two inches. On one occasion, the 27th of December, 1855, the snow which fell at daylight, amounting, when melted, to 0.016 inches by the rain gauge, was added to the amount. This was the heaviest fall of snow ever experienced; indeed only three other instances of this phenomenon appear on our record, and in all three the fall was very light. Hail storms are more common. These, also, are of short duration, and are attended with more or less disturbance of the electrical equilibrium. The breaking up of the rainy season is the period of the most violent manifestations of these latter phenomena. With the exception of the spring of 1857, which was a season of drought, hail and thunder storms have invariably occurred during the months of April and May, but have never been very severe in this immediate locality. A hail storm which

occurred at a point within eight miles of the city, in May, 1854, is represented to have been very violent. But we have experienced nothing in this locality like that, proceeding from a dense nimbus, which suddenly arose from the southwest on the 13th of May, 1855, and, while discharging its watery contents, rivalled, in the vivid shocks of its well-charged battery, the thunder gusts of more tropical regions.

The aurora borealis has been observed only once—on the night of the 16th of December, 1857; the sky being entirely clear at the time, the wind light, from the east—the thermometer reading 44°, and the barometer 30.321 inches, reduced for temperature. This phenomenon first appeared in a northeast direction, in the form of a diffused light defined by an arch below. From this arch, of about 15° radii above the horizon, the light extended in width apparently 10° above Alioth, in the constellation of the Great Bear, and gradually spread over the whole northern section of the heavens, the dominant hue being deep rose. Its aspect, however, was frequently changed by the successive appearance and shifting of streaks or columns of white light, which seemed to be more conspicuous at either extremity of the arch. With the exception of a somewhat similar phenomenon seen once at Sonora, Tuolumne county, during the winter of 1852–'53, we have heard of no other instance of the aurora being seen in California.

Before proceeding to a consideration of the rains we would, in this connexion, briefly refer to the transparency of the atmosphere for which California has been noted. The relative frequency of clear and cloudy days in summer and winter, as appears in the tables, although substantially correct, does not convey a just idea of the clearness of the sky. The results are calculated from three daily observations; and if it so happens that at either of these the least cloudiness is visible it is recorded as a cloudy day, without regard to quantity. Now, one of the peculiarities of the summer climate is, that if there be any cloudiness during the day, which is rarely the case, it is almost invariably clear at night. Indeed, on this account, perhaps there is no region better adapted to astronomical purposes; for, as Sir David Brewster expressed his wish, "no clouds disturb the serenity of the firmament, and no changes of temperature distract the emanations of the stars." As to the quantity of cloudiness, this not having been estimated previously to the last two years, of course the results in this respect cannot be regarded but as approximative to a constant, the number of cloudy days having been in excess during 1856 and 1857.

### RIVER, RAINS, ETC.

The rise and fall of the river at Sacramento is graduated by the terms high and low-water mark, or zero. A solid column, surmounted with a wind-vane, was set up by the city near the river bank in September, 1856, when the river had attained the lowest stage ever known. The fig. 2 in the accompanying hydrographic scale agrees with the zero in our published observations up to that date. The mean depth of the channel of the river in this neighborhood is 16 feet below low-water mark, and the width of the river is about 300 yards. There is a tidal rise and fall of about one to two feet at Sacramento,

ding to the course and force of the wind and the stage of the . If the wind blows strongly from the north this fall is still er, especially during spring tides. The stage of the water is affected by the temperature, as well as by the fall of rain. The hs of November, December, January, February, March, and l constitute the "rainy season," although more or less rain rally falls during October and May. The first and generally the eat rise in the river occurs about the 1st of January, after the rains. The warmer these rains are the less snow falls in the ntains, and consequently the more sudden is the rise of the river. n the middle of January to the middle of February there is gene- a marked abatement, and sometimes a complete suspension of and the river declines correspondingly. From the middle of uary to the last of April the latter or warmer rains set in, and a second or spring rise, which is kept up in accordance with the ailing temperature. If the spring and early summer have been the spring freshet soon passes off, and the river maintains a level, as it did in 1857, in consequence of the gradual melting ne snow at its sources; and the converse obtaining if the hot her sets in early. Recurring to the hydrographic scale, we would ve that the figures to the left indicate, when applied to the river, number of feet from zero or extreme low-water mark at spring to the highest point the Sacramento has yet been known to rise, nearly 22 feet, in January, 1852. The curves for all the years not complete, our notes not being full and regular. The same of feet, if read for inches, when applied to the perpendicular , will denote at a glance, and which is most important in this exion, the *monthly* quantity of rain that fell at Sacramento during last five years—the rain for 1853–'54 being placed in the first nn of each month, of 1855 in the second, and of 1856–'57 in the l. The scale to the right represents inches, and is intended to the comparative annual fall of rain since the year 1852. As readily be seen, the rains during 1856–'57 have been so much w the average that they should be regarded as exceptional. aging the rains of 1852–'53–'54–'55, we find an annual fall ,352 inches; whereas the average of the last five years gives only 13 inches. In the rain chart of the Army Meteorological Regis- Sacramento is included with San Francisco in the area of 22 inches ain; and Dr. Gibbons puts down the mean annual rain of the r place at 21.17 inches. This corresponds with our estimate of amount for Sacramento, and rather strengthens the opinion just essed, that the years 1856–'57 should be regarded as exceptional. ough the river is, of course, but slightly affected by the amount ain that falls in this immediate vicinity, nevertheless the con- on here preserved is of much interest, inasmuch as experience s that the amount of rain that falls at Sacramento bears a quan- ive proportion to that which is precipitated in the higher parts of valley, as well as in the mountains. Certainly, the river never has ned a high stage when there has occurred a deficit of rain at amento. To substantiate these assertions the following facts, ensed from our publications in the California State Medical

Journal, will suffice. As therein stated the winter and spring of 1849–'50 was a season of continual outpourings. The first settlers tell us that the rain came down in torrents, and that tubs and casks left out at night were found full and overflowing next morning. This must, of course, be taken *cum grano salis*. There were no ombrometers in those mythical days, when the rain appears to have been as abundant as the gold. Doubtless the rains were copious; certainly they set in earlier than they have ever done since. "The first rain of 1849 took place on the 23d of September. Through the month of October they became much more severe and cold, and, as no adequate preparation had been made for protection against this element, the sufferings of the immigrants were consequently aggravated." * * * "Through the latter part of December and beginning of January, 1850, the rains were so heavy that serious apprehensions began to be entertained, for the first time, of an inundation." * * * "By Christmas the water was over the lower portions of the city; on the 8th of January, 1850, it rose rapidly; and on the 10th, and for several days after, there was no dry land in town, except the knoll at the public square." * * * "In a few days the waters subsided, the sun broke from its cloudy confines and shone bright and beautiful again. This weather continued until the heavy rains of the following March." * * * "On the 7th of April the waters began again to run into the town, and on the 8th the council voted an appropriation of money for constructing a temporary levee, which was made, and the principal business portion of the city saved from an overflow."—(History of the City.) The opening half of the winter of 1850–'51, when commence our own observations, was rainless, and consequently the river remained at low-water mark until January, 1851, during which month about three-fourths of an inch of rain fell, and a corresponding rise in the river occurred. From this period the river remained very low until April 5, when it attained, although by no means a high level, still a greater elevation than at any prior date of the season, and navigation continued open to most of the upper trading points on the Sacramento, as well as to Marysville, until the summer. The rains that fell during this interval amounted to about 4 inches.

The rainy season of 1851–'52 commenced early, and the river rose correspondingly. By the 30th December it was up to within 4 feet of its natural banks, in consequence of the heavy rains which fell up to that date, amounting in the aggregate, during September, October, November, and December, to about 10 inches; thus compensating, in a measure, for the deficit of the previous season. The rain of the year 1852 was well distributed among all the months of the wet season, and amounted in the aggregate to about 27 inches. The heaviest rains occurred in March and December, and consequently the city was overflowed both these months, the levee not proving adequate. The first of these inundations occurred on the 7th March, owing to the washing away of the embankment at the flood-gate in the levee at Sutter lake, as well as to a crevasse on the American river; and for one week nearly the whole city remained submerged. The rains which followed after the great fire of November, 1852, were the heaviest known for

that season of the year of which we have any positive record. About 12 inches fell in December. Accordingly the river rose 17 inches higher than in the flood of 1850. From the 25th December to the 24th January, 1853, when the waters began to retire, the city remained almost entirely submerged. During the following March the fall of rain amounted to 7 inches, and again a corresponding rise of the river occurred. On the 29th it rose 12 feet in twenty-four hours, and soon reached above the original banks; and, backing up from a break in the levee at Sutterville, the greater part of the city was again overflowed by the 2d April, and thus remained more or less deluged until the rains subsided towards the last of May. The amount of rain that fell during the latter month was nearly 1½ inch, and the aggregate for January, February, March, April, and May, and which kept up the river at so high a level, was about 17 inches.

From the period to which we have thus brought down our account of the freshets of the Sacramento river and the corresponding rains, up to the present time, (1st January, 1858,) there has been no extraordinary rise to record, as may readily be seen by a glance at the hydrographic scale. As may also be there seen, the rains during the same interval have been considerably below the average.

*Abstract of Meteorological Observations made at Sacramento, California, during the year* 1856, *latitude* 38° 34′ 41″ *N., longitude* 121° 27′ 44″ *W., (as determined by G. H. Goddard, C. E, late of the State Surveyor General's office,) with monthly remarks.—By Thomas M. Logan, M. D.*

| 1856. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Mean. | Averages for four years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BAROMETER.** | | | | | | | | | | | | | | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* |
| Maximum | 30.242 | 30.305 | 30.271 | 30.230 | 30.079 | 30.114 | 30.036 | 29.990 | 30.065 | 30.294 | 30.344 | 30.619 | 30.215 | — .008 |
| Minimum | 29.629 | 29.692 | 29.665 | 29.599 | 29.614 | 29.626 | 29.694 | 29.657 | 29.569 | 29.721 | 29.750 | 29.707 | 29.660 | — .030 |
| Mean | 29.992 | 30.009 | 29.982 | 29.981 | 29.890 | 29.845 | 29.849 | 29.833 | 29.843 | 30.024 | 30.061 | 30.218 | 29.961 | — .034 |
| **THERMOMETER.** | | | | | | | | | | | | | | |
| | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees.* | *Degrees* | *Degrees.* | *Degrees.* |
| Maximum | 59.00 | 66.00 | 78.00 | 69.00 | 80.00 | 94.00 | 100.00 | 98.00 | 95.00 | 77.00 | 77.00 | 54.00 | 78.91 | — 1.52 |
| Minimum | 32.00 | 42.00 | 39.00 | 46.00 | 49.00 | 61.00 | 63.00 | 58.00 | 57.00 | 41.00 | 36.00 | 32.00 | 46.33 | + 1.13 |
| Mean | 48.02 | 52.64 | 57.03 | 58.80 | 63.91 | 71.06 | 75.12 | 69.59 | 70.93 | 58.04 | 52.18 | 43.86 | 60.09 | — 0.21 |
| **THERMOMETROGRAPH.** | | | | | | | | | | | | | | |
| Maximum | 60.00 | 69.00 | 79.00 | 70.00 | 83.00 | 97.00 | 100.00 | 99.00 | 98.00 | 78.00 | 79.00 | 54.00 | 80.00 | |
| Minimum | 30.00 | 37.00 | 37.00 | 43.00 | 45.00 | 52.00 | 55.00 | 53.00 | 52.00 | 37.00 | 34.00 | 29.00 | 42.00 | |
| Range | 30.00 | 32.00 | 42.00 | 27.00 | 38.00 | 45.00 | 45.00 | 46.00 | 46.00 | 41.00 | 45.00 | 25.00 | 38.00 | |
| **DEW POINT.** | | | | | | | | | | | | | | |
| Maximum | 53.00 | 52.00 | 64.00 | 59.00 | 60.00 | 65.00 | 66.00 | 66.00 | 59.00 | 56.00 | 55.00 | 48.00 | 58.70 | + 1.19 |
| Minimum | 29.00 | 22.00 | 31.00 | 35.00 | 45.00 | 29.00 | 22.00 | 24.00 | 24.00 | 29.00 | 31.00 | 28.00 | 29.08 | — 4.48 |
| Mean | 42.49 | 41.82 | 45.64 | 46.06 | 52.03 | 53.90 | 53.87 | 53.45 | 49.56 | 44.84 | 41.40 | 37.25 | 46.85 | — 0.88 |
| **RELATIVE HUMIDITY.** | | | | | | | | | | | | | | |
| Maximum | .946 | .943 | .939 | .938 | .886 | .890 | .811 | .810 | .876 | .939 | .939 | .944 | .905 | |
| Minimum | .676 | .364 | .413 | .412 | .387 | .175 | .096 | .119 | .113 | .268 | .251 | .520 | .316 | |
| Mean | .862 | .758 | .732 | .749 | .710 | .626 | .569 | .651 | .536 | .695 | .748 | .821 | .704 | |
| | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Days.* | *Totals.* | *Days.* |
| Number of clear days | 10½ | 13½ | 16 | 13 | 13½ | 21½ | 28½ | 25½ | 22½ | 18½ | 14 | 9 | 205½ | — 9½ |
| Number of cloudy and foggy days | 20½ | 15½ | 15 | 17 | 17½ | 8½ | 2½ | 5½ | 7½ | 12½ | 16 | 22 | 160½ | + 12½ |
| Number of rainy days | 17 | 4 | 5 | 8 | 4 | 1 | ..... | ..... | ½ | 1½ | 6½ | 8 | 55½ | — 2½ |
| Quantity of clouds | 6.6 | 4.7 | 5.7 | 6.5 | 5.6 | 3.1 | 3.8 | 3.5 | 3.8 | 6.1 | 6.9 | 7.4 | 5.3 | |
| Inches of rain | 4.919 | 0.692 | 1.403 | 2.139 | 1.841 | 0.033 | ..... | ..... | Sprinkle | 0.195 | 0.651 | 2.396 | 14.969 | — 3.901 |

Abstract of Meteorological Observations—Continued.

| 1856. | January. | | February. | | March. | | April. | | May. | | June. | | July. | | August. | | September. | | October. | | November. | | December. | | Mean. | | Averages for four years. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | | | | | | *Days.* |
| 1st days and 2d force of N. wind... | 10 | 1.7 | 7⅞ | 1.6 | 4½ | 1.3 | 4⅞ | 1.6 | 1½ | 1.1 | 4 | 2.1 | 1⅞ | 2.1 | ⅞ | 1.0 | 4⅞ | 1.3 | 7½ | 1.8 | 8 | 2.1 | 6 | 1.8 | 60½ | 1.6 | + 27½ |
| Do.....do....NW. wind. | 7⅞ | 1.8 | 10 | 3.3 | 7 | 1.4 | 5½ | 1.7 | 2½ | 1.8 | 4⅞ | 1.9 | 2½ | 2.0 | 1⅞ | 1.8 | 4½ | 2.3 | 7⅞ | 2.0 | 7 | 2.6 | 8⅞ | 2 1 | 69 | 2.0 | — 30 1-6 |
| Do .....do....W. wind .. | 1 | 0.8 | 1½ | 1.5 | 2⅞ | 0 7 | 3⅞ | 1.5 | 1⅞ | 2.1 | 2½ | 2.8 | ⅞ | 2.5 | 1½ | 1.6 | 2 | 1.7 | 1 | 1.6 | 1⅞ | 2.3 | ⅞ | 1.3 | 20 | 1.7 | + 5⅞ |
| Do.....do....SW. wind. | ½ | 0.3 | 1½ | 1.5 | 4⅞ | 1.1 | 4⅞ | 1.7 | 7⅞ | 1.6 | 4½ | 2.0 | 9 | 2.4 | 4½ | 2.1 | 4 | 1.9 | 2½ | 2.0 | 2 | 1.5 | 2⅞ | 2.0 | 48½ | 1.6 | — 18½ |
| Do.....do... S. wind... | 1 | 1.8 | 1⅞ | 1.0 | 1 | 0.6 | 5½ | 1.9 | 11⅞ | 1.7 | 11½ | 2.2 | 10⅞ | 2.2 | 11 | 2.1 | 6 | 2.2 | 5½ | 2.5 | 2 | 2.6 | 1½ | 1.6 | 67½ | 1.8 | + 16 |
| Do.....do....SE. wind... | 4½ | 2.2 | 4 | 1.3 | 6⅞ | 1.6 | 5⅞ | 2.1 | 6 | 1.5 | 2½ | 2.0 | 5⅞ | 2.5 | 10½ | 2.6 | 5 | 2.1 | 5⅞ | 2.4 | 5⅞ | 2.4 | 8 | 2.8 | 69½ | 2.1 | — 7 |
| Do.....do....E. wind ... | 3⅞ | 1.7 | 2 | 1.0 | 2 | 1.0 | ½ | 1.0 | .... | ..... | ½ | 1.0 | ½ | 2.0 | ⅞ | 2.0 | 1½ | 1.2 | 1½ | 1.3 | 1⅞ | 1.3 | .... | .... | 13⅞ | 1.1 | + 3½ |
| Do.....do....NE. wind. | 3 | 1.5 | 1 | 1.7 | 2⅞ | 1.0 | ½ | 1.0 | ½ | 1.0 | ⅞ | 2.5 | ⅞ | 1.5 | 1 | 2.0 | 2½ | 1.0 | ½ | 1 0 | 2 | 2.0 | 3½ | 1.7 | 18 | 1.4 | + 7 1-6 |

## GENERAL REMARKS.

The foregoing table for 1856 is the result of three daily observations, made at 7 a. m., 2 p. m., and 9 p. m., with the instruments and instructions recommended by the Smithsonian Institution. The readings of the barometer have been reduced to the temperature of 32° Fahrenheit, but not to sea level. The height of the lower surface of the mercury is 41 feet above the mean level of the sea at San Francisco. The rainy days are included in the cloudy and foggy days, and are also put separately to show the number of these days on which rain fell every month. Professor Coffin's psychrometrical table for determining the elastic force of aqueous vapor and the relative humidity of the atmosphere will be used in our register hereafter, and the dew-point column omitted. The following corrections of errata are to be applied to our tables for 1853–'54, published in the Smithsonian Report for 1855: Barometer mean for September, 1853, 30.00, and mean mean 30.02 inches; mean of barometer for January, 1854, 30.11 inches.

## MONTHLY REMARKS.

*January.*—The means of the barometer and thermometer were above the average of the three preceding years, the former by 0.254 inch, and the latter by 3.59 degrees. The rainy days exceeded the average to the number of seven. There were five days of more or less fog. The quantity of rain was plus the average 1.460 inch. A sprinkle of snow, just enough to be perceptible, occurred on the 8th at 9 a. m. On the 3d frost remained all day unthawed in the shade.

*February.*—There was little variation in the atmospheric pressure from that of previous years. The mean temperature was plus the average by 1.14 degree. Spring opened early. On the 7th the willow (*Salix*) flowered. On the 13th the buttercup, and on the 16th the wild violet were also in blossom. The rain fell short of the average by 1.460 inch.

*March.*—The temperature exceeded the average still more this month, being plus 3.12 degrees. Spring progressed rapidly. On the 1st the peach was in full blossom, and on the 10th was leafed out. Although the deficit of rain for the month amounted to 2.560 inches, frequent showers, accompanied on the 29th by lightning and thunder, tempered, in this locality, the effects of the drought which prevailed generally throughout the State.

*April.*—There was very little variation in the readings of the barometer and thermometer from that of previous years. Seasonable rains invigorated vegetation, and although nothing like the deficiency was made up, still the Sacramento river remained comparatively high for the season, in consequence of the warm rains melting the snow. Its temperature averaged about 54°, being four degrees lower than that of well water. The last frost of the season occurred on the 29th. The barn swallow made its first appearance on the 1st, and toward the latter part of the month wild geese were observed wending their

ray northwardly. At the last of the month salmon and sturgeon ogan to ascend the river in considerable numbers.

*May.*—The average readings of the barometer and thermometer id not vary much from those of the four preceding Mays. The prongation of the wet season to the last of the month somewhat comensated for the deficiency of the semestral fall of rain, which was educed down to 6.263 inches. On the evenings of the 6th, 8th, and th sheet lightning in the northern horizon revealed the time of ccurrence of terrific hail storms at various points at these respective ates. That which occurred at Butte creek, Shasta county, was ccompanied by a gale, the belt of which was not over half a mile in ridth, and the extent of ground on which the largest sized hail fell wo miles. These hailstones were about the size of carbine balls, of nucleus of ice surrounded by snow, apparently. On the 21st snow ell lower down on the foot hills than at any previous time during the vinter. The temperature of the river still remained 4 degrees lower han that of well water, the current running at the rate of four miles n hour.

*June.*—Throughout the whole month the weather was very variable. nstead of the close, sultry atmosphere that usually obtains as the un enters the calm belt of Cancer, strong, chilly winds, varying from SW. to WNW., just at the period of the summer solstice, preailed, freighted with moisture from the ocean. As the land, howver, had already attained a high degree of temperature, of course it ould not condense the vapors of water held by the air; consequently o rain fell after the 1st, when 0.033 inch are now chronicled as the ast for this extraordinary season. The total amount, therefore, of ain for the season of 1855–'56, at Sacramento, was minus the average .264 inches The river continued to fall steadily. Its temperature n the 21st was 4 degrees higher than that of well water 12 feet elow the surface, which fact showed that the great bulk of the nelted snow from the mountains had passed off.

*July.*—Notwithstanding the cloudless sky which characterized early this whole month, the tempering of the atmosphere by fresh outherly breezes was more obvious to one's feelings than by the thernometer, the mean of which was only 0.60 minus the average of the hree preceding Julys. During the few days that northwardly winds redominated the heat became intense. An important meteorological act connected with this unpleasant wind is that all the moisture has een wrung out of it that a dew-point of zero in the cold latitudes ould extract. It is, indeed, a return wind, which, after blowing over he surface fresh from the ocean, grows colder as it goes north, where he process of condensation commences, and when it comes back it is s parching and obnoxious to animal and vegetable life as the simoon f the eastern deserts. The river reached a very low stage this month, nd its temperature at 12 feet below the surface read 75°, while well vater at the same depth was 66°.

*August.*—This last of the summer months closed after a remarkbly cool summer. The whole number of days of extreme heat, in which he thermometer reached 90° and upward, amounted to only 11 for he summer, viz: two in June, six in July, and three in August. On

the 26th the temperature of the earth at 53 feet below the surface (the depth then obtained in an artesian well) was 60°, the thermometer having fallen about a degree and a half for every 10 feet from the depth of 15 feet, at the time of reaching which latter depth it read 66°.

*September.*—This month was characterized by variable weather. The barn swallow made its last appearance on the 5th. On the 10th, at 5½ o'clock p. m., we were suddenly visited with a high wind from a heavy bank of clouds in the southwest horizon, which at one time presented indications of approaching rain, but was intercepted by the arid mountains and high lands of Santa Cruz, Alameda, and San Francisco, where the accompanying lightning and thunder are reported to have been extremely violent.

For several days previous to the equinox a regular declension of atmospheric pressure was experienced, attended with a stagnant, sultry condition of the air. This was succeeded by a sprinkle of rain (the first of the season in this locality) at daylight on the 20th, when the lowest reading of the barometer, as above, was recorded. As the sun entered Libra, however, the weather presented one of the most favorable specimens of our autumnal climate, a fresh circulation of air being kept up by southerly breezes.

The most remarkable feature of the month was the brilliant ærolite which appeared on the evening of the 11th, at about 8 o'clock. As it was seen simultaneously in an area of several hundred miles, bounded by Red Bluffs, Iowa Hill, Stockton, San Francisco, and Santa Cruz, the probabilities are that at the time of its brief appearance it was in the upper regions of our atmosphere, and that, judging from the interval that elapsed between its explosion and the reaching of the report here, which resembled distant thunder, its distance then was between thirty and thirty-five miles. After comparing all the different accounts that have reached us, it would seem that its course was on the southern side of the zenith, from SE. to NW., and that its relative position to the point of aspect here was at first about forty degrees above the horizon, and twenty when it vanished. When first seen it appeared but little larger than Venus, but as it approached the earth it increased in size as suddenly as it diminished again just before bursting into brilliant corruscations of light that reflected all the prismatic colors. The moon was near the close of its second quarter at the time, and the atmosphere clear and transparent.

The Sacramento river fell to a lower point than has ever been before observed, which will be the zero of the scale of a new river gauge about to be constructed by the city. Its present mean temperature twelve feet below the surface reads 70°, while that of well water at the same depth is 60°. The temperature in the artesian well at sixty-five feet below the surface is 59½°.

*October.*—The mean temperature of this month was 5°.47 minus the average. On the 1st the flight of wild geese southwardly, which had been observed since the 8th September, prepared us to expect the rain that fell on five different days—the 7th, 15th, 17th, 19th, and 24th; and though not amounting to much in quantity, it was sufficient to indicate that the atmospherical changes which characterize the rainy season had set in. The first frost occurred on the 20th, and ice

formed on the 22d, at daylight. The effect of the rains and snows was sensibly demonstrated in the Sacramento river, both quantitatively and thermometrically. On the 17th, it rose suddenly ten inches, and fell again immediately to low water mark; its temperature declining 12° lower than that of the previous month. The temperature of well water fell to 57°. On the last day of the month the leaves of the willow began to fall.

*November.*—Although the readings of the barometer were not much below the average, more or less stormy weather prevailed over the greater part of the State. In the south, the setting in of the rains was attended by disasters of a somewhat novel character. A shower of sand swept over a portion of Los Angeles county, completely destroying the grass on the pasture lands About the same period, severe gales prevailed at Humboldt Bay. The mornings of the 27th and 30th were unusually cold for the season. The rains of the month did not make much impression on the river, further than a rise of about 9 inches; its temperature was 46°, while that of well water was 59°. The temperature of the Artesian well, at 73 feet, where it was discontinued, stood at 58°.50. The fall of leaf of the fig, apple, pear, and cotton-wood tree occurred on the 1st, 5th, and 30th dates of the month respectively.

*December.*—The month was rendered remarkable for the unprecedented persistence of continuous cold weather and the number of cloudy days—much beyond the average of the three previous years. The barometer maintained an unusually high range in consequence of the prevalence of northerly winds. The readings of its extraordinary maxima were made on the evening of the 19th and morning of the 20th, while the wind was fresh from the N.NW., and the temperature ranged from 30° to 40°. Its diurnal mean fell only five times below 30 inches. The minimum was registered on the 29th at 9 p. m., preceding a SE. storm which was general throughout the State. On the same day it snowed at San Francisco, and about the same period the Coast range of mountains presented the unusual appearance of being covered with snow. The river was not much affected by the rains of the month; its temperature read 41°.

*Abstract of Meteorological Observations, by Thos. M. Logan, M.D., Sacramento, California.*

| 1857. | January. | February. | March. | April. | May. | June. | July. | August. | Septemb'r. | October. | Novemb'r. | Decemb'r. | Means. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **BAROMETER.** | | | | | | | | | | | | | |
| Maxima | 30.423 | 30.438 | 30.343 | 30.204 | 30.140 | 30.044 | 30.007 | 30.002 | 30.121 | 30.170 | 30.263 | 30.449 | 30.222 |
| Minima | 29.791 | 29.725 | 29.772 | 29.777 | 29.707 | 29.640 | 29.658 | 29.661 | 29.710 | 29.644 | 29.673 | 29.808 | 29.714 |
| Means | 30.215 | 30.081 | 30.083 | 29.971 | 29.940 | 29.850 | 29.822 | 29.845 | 29.916 | 29.942 | 30.082 | 30.165 | 29.991 |
| **THERMOMETER.** | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° |
| Maxima | 61 | 59 | 68 | 79 | 87 | 98 | 90 | 92 | 84 | 79 | 65 | 57.00 | 76.72 |
| Minima | 31 | 34 | 44 | 55 | 53 | 61 | 62 | 60 | 58 | 49 | 38 | 37.00 | 45.17 |
| Means | 48.54 | 50.25 | 56.42 | 63.27 | 65.51 | 71.93 | 71.45 | 71.31 | 67.92 | 61.49 | 53.24 | 47.37 | 60.73 |
| **THERMOMETROGRAPH.** | | | | | | | | | | | | | |
| Maxima | 63 | 62 | 69 | 83 | 91 | 101 | 94 | 96 | 86 | 79 | 67 | 58 | 79.08 |
| Minima | 30 | 30 | 40 | 45 | 51 | 54 | 53 | 55 | 52 | 45 | 35 | 32 | 43.50 |
| Range | 33 | 32 | 29 | 38 | 40 | 47 | 41 | 41 | 34 | 34 | 32 | 26 | 35.58 |
| **DEW POINT.** | | | | | | | | | | | | | |
| Maxima | 53 | 54 | 54 | 64 | 63 | 72 | 59 | 60 | 58 | 56 | 58 | 49 | 58.33 |
| Minima | 26 | 26 | 35 | 30 | 37 | 35 | 36 | 38 | 36 | 29 | 26 | 30 | 32.08 |
| Means | 43.44 | 43.51 | 47.53 | 51.90 | 51.96 | 54.13 | 52.65 | 51.38 | 49.67 | 46.21 | 42.11 | 39.68 | 47.78 |
| **FORCE OF VAPOR.** | | | | | | | | | | | | | |
| Maxima | .423 | .423 | .442 | .635 | .762 | .873 | .628 | .572 | .551 | .483 | .491 | .313 | .569 |
| Minima | .136 | .090 | .204 | .223 | .282 | .287 | .316 | .311 | .308 | .143 | .095 | .123 | .213 |
| Means | .295 | .297 | .347 | .421 | .427 | .500 | .474 | .454 | .415 | .352 | .286 | .253 | .377 |
| **RELATIVE HUMIDITY.** | | | | | | | | | | | | | |
| Maxima | 100 | 100 | 94 | 100 | 88 | 85 | 83 | 84 | 82 | 94 | 100 | 93 | 91.92 |
| Minima | 61 | 28 | 45 | 32 | 34 | 24 | 32 | 26 | 27 | 33 | 29 | 30 | 39.42 |
| Means | 84.28 | 80.33 | 78.16 | 75.03 | 69.43 | 66.22 | 64.33 | 62.47 | 63.75 | 66.18 | 69.62 | 77.65 | 71.45 |
| Number of clear days | 5½ | 8½ | 9½ | 20½ | 17½ | 18½ | 26½ | 22½ | 19 | 16½ | 11½ | 10½ | 187½ |
| Number of cloudy and foggy days | 22 | 4 | 16 | 8½ | 12½ | 10½ | 3½ | 7½ | 11 | 12½ | 8½ | 12½ | 128½ |
| Number of rainy days | 3½ | 15½ | 5½ | 1 | 1 | 1 | 1 | 1 | 0 | 2 | 10 | 8 | 49 |
| Quantity of clouds | 8.2 | 8.6 | 6.1 | 4.3 | 2.0 | 1.4 | 0.2 | 1.0 | 1.9 | 2.1 | 3.8 | 4.6 | 3.7 |
| Quantity of rain and fog | 1.375 | 4.801 | 0.675 | Sprinkle. | Sprinkle. | 0.360 | 0.012 | Sprinkle. | 0.000 | 0.655 | 2.406 | 2.632 | 12.906 |

Abstract of Meteorological Observations—Continued.

| 1857. | January. | | February. | | March. | | April. | | May. | | June. | | July. | | August. | | September. | | October. | | November. | | December. | | Means. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st days and 2d force of N. wind.... | 9 | 1.6 | 5½ | 2.1 | 4½ | 1.4 | 6⅝ | 1.7 | 1⅞ | 1.7 | 1⅜ | 0.3 | 2⅝ | 1.3 | 2⅝ | 1.1 | 5 | 0.7 | 7⅜ | 0.7 | 5 | 2.2 | 7½ | 1.5 | 59 | 1.4 |
| Do.....do.....NE wind... | ⅜ | 1.0 | 0 | 0 | ⅜ | 1.0 | ½ | 0.7 | ½ | 0.6 | 0 | 0.0 | 0 | 0.0 | ⅜ | 0.5 | ⅜ | 0.3 | 2 | 0.7 | 1⅝ | 0.9 | 1⅜ | 1.0 | 8⅜ | 0 6 |
| Do.....do.....E. wind .... | 1⅜ | 0.6 | 1½ | 1.5 | 2½ | 0.6 | 1⅝ | 1.3 | ½ | 0.3 | ⅜ | 0.3 | ½ | 0.3 | 0 | 0.0 | ½ | 0.3 | 1 | 1.0 | 3⅜ | 1.2 | 3⅜ | 1.2 | 17 | 0.7 |
| Do.....do .....SE. wind... | 6½ | 1.3 | 9½ | 1.6 | 3⅞ | 1.5 | 3 | 2.4 | 9 | 2.2 | 7 | 1.7 | 7⅜ | 1.8 | 9⅜ | 1.1 | 7 | 1.1 | 5½ | 1.0 | 7 | 2.0 | 7 | 2.5 | 82 | 1.7 |
| Do.....do.....S. wind..... | 7 | 1.6 | 4⅜ | 1.5 | 5 | 1.5 | 6½ | 2.3 | 8 | 2.1 | 9 | 2.1 | 12⅜ | 1.9 | 8½ | 2.0 | 6⅜ | 2 0 | 3 | 1.7 | 2 | 3.1 | ⅜ | 1.3 | 73½ | 1.9 |
| Do..... do..... SW. wind .. | 1 | 1.0 | 1⅝ | 1.6 | 7½ | 1.3 | 8½ | 2.1 | 6 | 2.0 | 6⅜ | 2.0 | 5⅜ | 1.9 | 7 | 1.6 | 5⅜ | 1 3 | 3 | 1.3 | 2½ | 1.8 | 1½ | 1.8 | 56 | 1.6 |
| Do.....do.....W. wind ... | ½ | 0.6 | 1 | 1.1 | ⅜ | 0.6 | ⅜ | 1.3 | ⅜ | 1.0 | ⅜ | 0.7 | 0 | 0.0 | 1 | 1 7 | ⅜ | 0.2 | 1½ | 1.0 | ⅜ | 1.7 | 0 | 0.0 | 7⅜ | 0.8 |
| Do.....do.....NW. wind.. | 5 | 1.8 | 4⅜ | 1.9 | 7 | 1.5 | 3 | 1.7 | 5 | 1.8 | 4½ | 1.2 | 2 | 1.0 | 1⅜ | 0.5 | 4 | 1.6 | 7⅜ | 1.1 | 7⅜ | 2.3 | 9½ | 1.8 | 61½ | 1.5 |

*Table of the results of Meteorological Observations for five years at Sacramento, California, by Thomas M. Logan, M.D.*

| 1853-'54-'55-'56-'57. | MONTHLY MEANS. | | | | | | | | | | | | ANNUAL MEANS. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan. | Feb. | March. | April. | May. | June. | July. | August. | Sept. | Oct. | Nov. | Dec. | 2 years | 3 years. | 4 years. | 5 years. |
| **BAROMETER.** | | | | | | | | | | | | | | | | |
| | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | *Inches* | *Inches.* | *Inches.* | *Inches.* | *Inches.* | | | | *Inches.* |
| Maxima | 30.351 | 30.353 | 30.309 | 30.291 | 30.174 | 30.136 | 30.105 | 30.036 | 30.067 | 30.241 | 30.341 | 30.408 | ..... | ..... | ... | 30.234 |
| Minima | 29.620 | 29.663 | 29.765 | 29.735 | 29.690 | 29.547 | 29.748 | 29.702 | 29.736 | 29.789 | 29 715 | 29.749 | ..... | ..... | ..... | 29.705 |
| Mean | 30.054 | 30 070 | 30.057 | 30.050 | 30.000 | 29.869 | 29.958 | 29.900 | 29.894 | 30.049 | 30.085 | 30.107 | ..... | ..... | ..... | 30.006 |
| **THERMOMETER.** | | | | | | | | | | | | | | | | |
| | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° | ° |
| Maxima | 61.40 | 65.00 | 72.60 | 76.00 | 82.40 | 95.80 | 96.70 | 96.00 | 91.60 | 85.40 | 71.00 | 60.40 | ... ... | ..... | .. ... | 79.53 |
| Minima | 28.40 | 36.80 | 41.40 | 48.20 | 49.60 | 56.20 | 59.15 | 57.60 | 53.00 | 48.40 | 39.60 | 31.00 | ..... | ... .... | ..... | 45.78 |
| Mean | 45.25 | 51.28 | 54.41 | 60.23 | 63.92 | 71.62 | 74.95 | 70.88 | 69.58 | 64.11 | 52.82 | 46.63 | ..... | ..... | ..... | 60.47 |
| **THERMOMETROGRAPH.** | | | | | | | | | | | | | | | | |
| Maxima | 61.50 | 65.50 | 74.00 | 76.50 | 87.00 | 99.00 | 97.00 | 97.50 | 92.00 | 78.50 | 73.00 | 56.00 | 79.79 | ..... | ..... | ..... |
| Minima | 30.50 | 33.50 | 38.50 | 44.00 | 48.00 | 53.00 | 54.00 | 54.00 | 52.00 | 41.00 | 34.50 | 30.50 | 42.75 | ..... | ... | ..... |
| Range | 31.50 | 32.00 | 35.50 | 32.50 | 39.00 | 46.00 | 43.00 | 43 50 | 40.00 | 37 50 | 38.50 | 25 50 | 37.04 | ..... | ..... | ..... |
| **DEW POINT.** | | | | | | | | | | | | | | | | |
| Maxima | 50.17 | 52.50 | 59.00 | 60.00 | 61.00 | 68.67 | 63.25 | 63.62 | 57.14 | 56.00 | 54.62 | 49.50 | ..... | 58.56 | 57.36 | ..... |
| Minima | 28.33 | 22.00 | 32.67 | 33.83 | 38.00 | 35.67 | 37.88 | 37.75 | 35.38 | 34.00 | 30.75 | 24.63 | ..... | 31.75 | 33.40 | ..... |
| Mean | 41.34 | 42.23 | 46.10 | 47.75 | 50.13 | 54.70 | 54 73 | 52.64 | 48.75 | 47.14 | 42.10 | 38.71 | ... .... | 47.04 | 47.35 | ..... |
| **RELATIVE HUMIDITY.** | | | | | | | | | | | | | | | | |
| Maxima | 97.30 | 97.15 | 93.95 | 96.90 | 88 30 | 87.00 | 82.05 | 82.50 | 84.80 | 93.95 | 96.95 | 93.70 | 91.21 | ..... | ..... | ..... |
| Minima | 64.30 | 32.20 | 43.15 | 36.60 | 36.35 | 20.75 | 20.80 | 18.95 | 19.15 | 29.90 | 27.05 | 41.00 | 32.52 | ..... | ..... | ..... |
| Mean | 85.24 | 78.07 | 75.68 | 74.92 | 70.22 | 64.14 | 60.62 | 63.79 | 58.68 | 67.84 | 72 21 | 79.88 | 70.94 | ..... | ..... | ..... |
| Number of clear days | 10 | 13 6-15 | 13 14-15 | 13 5-15 | 17 13-15 | 22 2-15 | 25 12-15 | 24 3-15 | 33 5-15 | 17 14-15 | 14 2-15 | 13 13-15 | ..... | ..... | ..... | 21 0 6-15 |
| Number of cloudy and foggy days | 12 2-15 | 5 5-15 | 11 | 10 1-15 | 8 14-15 | 5 12-15 | 4 3-15 | 6 6-15 | 5 10-15 | 10 5-15 | 9 8-15 | 9 14-15 | ..... | ..... | ..... | 9 9 5-15 |
| Number of rainy days | 8 13-15 | 9 4-15 | 6 1-15 | 6 9-15 | 4 3-15 | 1 9-15 | 1 | 6-15 | 1 | 2 11-15 | 6 5-15 | 7 3-15 | ..... | ..... | ..... | 55 4-15 |
| Quantity of clouds | 7.4 | 6 7 | 6.9 | 5.4 | 3.8 | 2.3 | 2.0 | 2.3 | 2.9 | 4.1 | 5.4 | 6.0 | 4.5 | ..... | ..... | ..... |
| Quantity of rain, in inches | 3.043 | 3.891 | 3.306 | 2.290 | 0.930 | 0.141 | 0.003 | Spkle. | 0.001 | 0.373 | 1.191 | 1.944 | ..... | ..... | ..... | 17.113 |

*Meteorological Observations*—Continued.

| 1853-'54-'55-'56-'57. | MONTHLY MEANS. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | January. | | February. | | March. | | April. | | May. | |
| 1st days and 2d force of N. wind..... | 5 8-15 | 1.7 | 4 7-15 | 1.9 | 3 2-15 | 1.4 | 3 7-15 | 1.7 | 1 3-15 | 1.4 |
| Do.....do .....NE. wind..... | 1 7-15 | 1.3 | 1 1-15 | 0.9 | 1 2-15 | 1.0 | 8-15 | 0.9 | 5-15 | 0.8 |
| Do.....do.....E. wind..... | 1 8-15 | 1.2 | 1 8-15 | 1.3 | 1 2-15 | 0.8 | 12-15 | 1.2 | 8-15 | 0.2 |
| Do.....do.....SE. wind..... | 7 | 1.8 | 6 1-15 | 1.5 | 5 10-15 | 1.6 | 4 14-15 | 2.3 | 6 4-15 | 1.9 |
| Do.....do.....S. wind..... | 2 14-15 | 1.7 | 2 4-15 | 1.3 | 3 8-15 | 1.1 | 4 2-15 | 2.1 | 7 6-15 | 1.9 |
| Do.....do.....SW. wind..... | 1 13-15 | 0.7 | 2 6-15 | 1.6 | 6 6-15 | 1.2 | 7 4-15 | 1.9 | 8 2-15 | 1.8 |
| Do.....do.....W. wind..... | 8-15 | 0.7 | 10-15 | 1.3 | 1 4-15 | 0.7 | 1 7-15 | 1.4 | 13-15 | 1.6 |
| Do.....do.....NW. wind..... | 10 2-15 | 1.8 | 9 11-15 | 2.1 | 8 11-15 | 1.5 | 6 14-15 | 1.7 | 5 12-15 | 1.8 |

| 1853-'54-'55-'56-'57. | MONTHLY MEANS. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | June. | | July. | | August. | | September. | | October. | |
| 1st days and 2d force of N. wind..... | 1 14-15 | 1.2 | 1 6-15 | 1.2 | 12-15 | 1.1 | 2 6-15 | 1 0 | 3 13-15 | 1.3 |
| Do.....do.....NE. wind..... | 5-15 | 1.3 | 3-15 | 0.8 | 7-15 | 1.2 | 1 1-15 | 0.7 | 10-15 | 0.9 |
| Do.....do.....E. wind..... | 6-15 | 0.7 | 2-15 | 1.2 | 5-15 | 0.8 | 10-15 | 0.8 | 10-15 | 1.2 |
| Do .....do.....SE wind..... | 5 3-15 | 1.9 | 9 2-15 | 2.2 | 12 1-15 | 1.6 | 7 | 1.6 | 5 5-15 | 1.7 |
| Do .....do.....S. wind..... | 8 3-15 | 2.2 | 8 1-15 | 2.1 | 7 10-15 | 2.1 | 5 2-15 | 2.1 | 2 12-15 | 2.1 |
| Do.....do.....SW. wind..... | 6 6-15 | 2.0 | 6 11-15 | 2.2 | 7 6-15 | 2.1 | 6 8-15 | 1.6 | 5 5-15 | 1.7 |
| Do.....do.....W. wind..... | 14-15 | 1.5 | 2 6-15 | 1.3 | 9-15 | 1.9 | 1 4-15 | 1 0 | 1 | 1.3 |
| Do.....do.....NW. wind..... | 6 2-15 | 1.6 | 2 14-15 | 1.5 | 1 10-15 | 1.3 | 5 14-15 | 2.0 | 11 5-15 | 1.6 |

| 1853-'54-'55-'56-'57. | MONTHLY MEANS. | | | | ANNUAL MEANS. | | | |
|---|---|---|---|---|---|---|---|---|
| | November. | | December | | 2 years. | 3 years. | 4 years. | 5 years. |
| 1st days and 2d force of N. wind..... | 5 5-15 | 2.2 | 4 8-15 | 1.7 | 1 5 | ..... | ..... | 38 1-15 |
| Do.....do.....NE. wind..... | 1 12-15 | 1.5 | 3 4-15 | 1.6 | 1.1 | ..... | ..... | 12 5-15 |
| Do.....do.....E. wind..... | 2 2-15 | 1.3 | 2 | 1.3 | 1.0 | ..... | ..... | 11 13-15 |
| Do.....do .....SE wind..... | 5 3-15 | 2.2 | 3 5-15 | 2.3 | 1.9 | ..... | ..... | 77 3-15 |
| Do.....do.....S. wind..... | 2 | 2.9 | 1 4-15 | 1.5 | 1.9 | ..... | ..... | 55 13-15 |
| Do.....do.....SW. wind..... | 3 3-15 | 1 7 | 4 9-15 | 2.3 | 1.7 | ..... | ..... | 66 8-15 |
| Do.....do .....W. wind..... | 13-15 | 2.0 | 12-15 | 0.0 | 1.3 | ..... | ..... | 12 10-15 |
| Do.....do .....NW. wind..... | 9 7-15 | 2.5 | 11 3-15 | 1.8 | 1.8 | ..... | ..... | 90 7-15 |

REMARKS.—The mean mean of the barometer for July is apparently higher than that of June, in consequence of some peculiar disturbing causes in June, 1853; which month should have been regarded as exceptional. 1856 being leap-year, of course a fractional part must enter into the average of the clear and cloudy days for February, as well as of the number of the days of the wind.

# ON THE BEST HOURS OF DAILY OBSERVATION TO FIND THE MEAN TEMPERATURE OF THE YEAR.

BY PROF. CHESTER DEWEY.

The mean temperature of a day is to be obtained, originally, from observations of the thermometer, taken twenty-four times daily, or double that number. The mean of daily and hourly observations of this kind must give a close approximation to the actual mean temperature. From a series of such hourly observations the *two*, or *three*, or *four* hours may be selected, which will give nearly an equivalent result.

The large Meteorological Society of Manheim, in Germany, selected the hours of 7 a. m. and 2 and 9 p. m., but I could find no reason for this selection in any accessible work, when I began observations in meteorology in 1815. In 1816 and 1817 I made twenty-four hourly observations of five days each in the different seasons; the first of the kind on record, so far as I know, being made for thirty days. The mean of the 24 observations is 41°.50; of 10 a. m. and 10 p. m, 41°.45; and of 7, 2 and 9 about one degree higher. Coming so near the mean I adopted those hours of the Manheim Society, for the ease of comparison with the results obtained by them.

The mean of observations at 6 a. m., 2 and 10 p. m., gave a close approximation to the mean of 24 observations; but the morning hour would be too early for half the year in view of many observers.

The results of this series of observed temperature I communicated to Secretary Calhoun, as he was about to organize the system of meteorological observations, so successfully made by the surgeons at the military posts of the United States since 1819. These hours were adopted for all the posts.

The fitness of these hours, 7 a. m., 2 p. m., and 9 p. m, for observations, is sustained by the following facts:

1. By the hourly observations for a year at Leith Fort, Scotland. These give the mean of 24 daily observations, 41°.50; of 10 a. m. and 10 p. m. very nearly the same; and of 7, 2 and 9 about *one-fourth* of a degree above the mean of the 24 observations.

2. By the hourly observations at Amherst College, Massachusetts, through 1839, under the direction of Prof. Snell. The mean of the 24 observations is 47°.23; of 10 a. m. and 10 p. m., is 47°.16; and of 7, 2 and 9, is 47°.88. This last, then, is *two-thirds of a degree* above the 24 mean. Prof. Snell shows the mean at 6 a. m.; 2 and 10 p. m. is nearly the same as the mean of the 24 observations.

3. By the "Girard Observations," under the direction of Prof. Bache, an extensive series of several years, bi-hourly and hourly.

The mean of 7, 2 and 9 is only three-tenths of a degree above that of 24 observations, and from this last, that of 10 and 10, differs only one-tenth of a degree.

4. Brooklyn Heights' Observations, hourly, for 1856, by E. Meriam, esq. I have summed only the first seven days in each month. The mean of 24 observations is 47°.72, and of 10 and 10 is very near the

same; while that of 7, 2 and 9 is 48°.28, or greater than the 24 mean by *one-half* a degree nearly.

5. At Sacramento, Cal., lat. 38 N. The 24 mean is 64°.41, and the mean of 7, 2 and 9 is 64°.11.

NOTE —By the last three it is evident that the mean of 7, 2 and 9 approaches nearer to that of the 24 mean, as the places have a lower latitude, and an examination of the 24 hours observation in the Arctic regions shows quite a departure of the mean of 7, 2 and 9 from the mean of 24 observations.

The 24 hourly observations give the mean of the year—

| | |
|---|---|
| At Halle | 48°.00 |
| At Gottingen | 52 82 |
| At Padua | 56 74 |

On calculating the mean of 7, 2 and 9, I find that—

| | |
|---|---|
| At Halle | 48 89 |
| At Gottingen | 53 45 |
| At Padua | 57 47 |

Observations on the temperature of Salem, Massachusetts, were made with much care by Dr. Holyoke for thirty-three years preceding 1819. The hours of observation were *four*, viz: 8 a. m., noon, sunset, and 10 p. m. By interpolating for sunset, in my series of 24 daily observations, I found that the mean from these four hours is only a little greater than that of the three hours, 7 a. m., 2 and 9 p. m. Dr. Holyoke's mean temperature of Salem is 48.68 degrees. The mean heat at Leith, by the 24 daily observations, is 48.24, and by the hours, 7, 2 and 9, is 48.50.

This approximation from these four hours, and one of them variable, is another unexpected result.

Between 1842 and 1855 the observations at the military posts were directed to be made at four periods of the day, viz: a *little before* sunrise as the *coldest* generally; at 3 p. m. as the *hottest*, and at 9 a. m. and 9 p. m. as approximating the mean temperature of the day, but half the sum of the observations at sunrise, S. R., and 3 p. m. was to be taken as the mean heat of the day. In the preparation of the "Army Meteorological Register," published in 1856, the fourth part of the sum of those four observations was taken as the mean of the day, because Dr. Coolidge and his associate became satisfied from extensive comparison of the twenty-four daily observations, that the mean of the four observations was nearer the twenty-four mean, than those at sunrise and 3 p. m. would give. Dr. Coolidge states also, that the evidence was clear from the comparison of numerous twenty-four hourly observations at the posts that the mean of 7, 2, and 9, was for all the posts, the nearest approximation of any hours selected to the mean of the twenty-four daily observations. In 1855, therefore, the Surgeon General, Dr. Lawson, issued his circular requiring a return to the original hours of observation, viz: 7 a m., 2 p. m., and 9 p. m.

In ascertaining the relative correctness of the results in the "Consolidated Tables" of the Army Meteorological Register, taken for

twenty-three years from the three daily observations, and for twelve years from the four hours' record, it was important to make some tests. These are as follows:

1. Prof. Snell performed the labor of interpolating for sunrise in his hourly observations for the year 1839, and sent to me the following result: While the mean of the twenty-four hourly observations is 47°.23, the mean of the four hours, S. R., 9 a. m., 3 and 9 p. m., is 47°.13, making a difference of only one-tenth of a degree.

This was an unexpected result, but of high interest. My own observations interpolated in the same way gave only a little greater difference.

2. The Consolidated Tables in the Army Meteorological Register yield the following proofs:

*a.*—For Fort Columbus, N. Y., p. 600, latitude 40°.42,

| | |
|---|---|
| The mean of 33 years is | 51°.69 |
| The mean of 7, 2, and 9, 21 years, is | 51°.42 |
| The mean of the four hours, 12 years, is | 51°.83 |

Either hours give a close approximation.

*b.*—For Alleghany Arsenal, Penn., p. 605, latitude 40°.32,

| | |
|---|---|
| The mean for 21 years is | 50°.86 |
| The mean of 7, 2, and 9, for 9 years is | 50°.43 |
| The mean of four hours, 12 years is | 50°.75 |

This is another close approximation.

*c.*—For Fort McHenry, Md., p. 607, latitude 39°.17,

| | |
|---|---|
| The mean of 21 years is | 54°.86 |
| The mean of 7, 2, and 9, of 12 years is | 53°.97 |
| The mean of four hours, 9 years is | 54°.86 |

*d.*—For Fort Monroe, Va., p. 608, latitude 37°.00,

| | |
|---|---|
| The mean of 30 years is | 59°.22 |
| The mean of 3 hours, 18 years is | 59°.29 |
| The mean of 4 hours, 12 years is | 59°.04 |

*e.*—For Fort Gibson, Indian Territory, p. 624, latitude 34°.47,

| | |
|---|---|
| The mean of 27 years is | 60°.81 |
| The mean of 3 hours, 15 years is | 61°.53 |
| The mean of 4 hours, 12 years is | 60°.19 |

*f.*—For Fort Gratiot, Mich., p 627, latitude 43°,

| | |
|---|---|
| The mean of 14 years is | 46°.29 |
| The mean of 3 hours, 9 years is | 46°.62 |
| The mean of 4 hours, 5 years is | 45°.30 |

*g.*—For Fort Brady, Mich., p. 629, latitude 46½°,

| | |
|---|---|
| The mean of 26 years is | 40°.37 |
| The mean of 3 hours, 18 years is | 40°.56 |
| The mean of 4 hours, — years is | 39°.53 |

*h.*—For Fort Snelling, Minn. Ter., p. 632, latitude 45°,

| | |
|---|---|
| The mean for 34 years is | 44°.54 |
| The mean for 3 hours, 22 years is | 45°.17 |
| The mean for 4 hours, 12 years is | 44°.06 |

*i.*—For Fort Leavenworth, Kan. Ter., p. 633, latitude 39⅓°,

| | |
|---|---|
| The mean of 23 years is | 52°.78 |
| The mean of 3 hours, 12 years is | 52°.35 |
| The mean of 4 hours, 11 years is | 52°.65 |

*k.*—For Jefferson Barracks, Mo., p. 625, latitude 38½°,

| | |
|---|---|
| The mean of 22 years is | 55° 46 |
| The mean of 3 hours, 11 years is | 56°.42 |
| The mean of 4 hours, 11 years is | 55°.77 |

In all these only whole years are introduced, while in the annual means of the Consolidated Tables, parts of years are sometimes introduced, which will account for a slight discrepancy to be noticed in some of the results.

The conclusion from the above results is that the observations at the three hours, and at the four, give close approximations.

To all this add the assertion of Dr. Coolidge, previously mentioned, which led to a return to the hours of 7 a. m., 2 and 9 p. m., at the Military Posts. At these three hours also, the observations under the direction of the Smithsonian Institution are made over the country.

These are convenient hours for recording observations over our extensive country, and the results need only slight correction, according to the publications in the Toronto Observations, and still less according to the data already detailed.

From the observations of 1839 at Amherst College, and the results communicated by Prof. Snell, I have deduced the following table of corrections. Their object is to give the monthly mean, and hence the annual mean of twenty-four daily observations, by applying the numbers in the table, to the monthly mean at any hour, according to their signs:

*Difference of the monthly means of each hour from the monthly mean of the twenty-four hours, being the correction to be applied to the monthly mean of each hour to obtain the means of the twenty four hours. Thermometer. Fahrenheit.*

| | January. | February. | March. | April. | May. | June. | July. | August. | Septem'r. | October. | Novemb'r. | December. | Mean for year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 a. m. | 3 90 | 2.78 | 4.73 | 6.23 | 5.51 | 6.64 | 6.39 | 5.14 | 5.36 | 4.87 | 2.34 | 1.63 | 4.63 |
| 2 a. m. | 4.24 | 3.03 | 4.81 | 6.69 | 6 48 | 7.28 | 6.83 | 5 66 | 6.12 | 5.65 | 2.99 | 2.20 | 5.16 |
| 3 a. m. | 4 13 | 3.20 | 5.36 | 7.42 | 7.41 | 7.92 | 7.28 | 6 03 | 6.92 | 6.46 | 3.49 | 2.55 | 5.68 |
| 4 a. m. | 4.50 | 3.94 | 5.69 | 7.85 | 7.88 | 8.04 | 7.42 | 6.29 | 6.56 | 7.09 | 3.72 | 2.70 | 6.06 |
| 5 a. m. | 4.72 | 4.20 | 6.04 | 8.12 | 8.18 | 7.80 | 7.54 | 6 66 | 7.88 | 7.72 | 4.03 | 3.32 | 6.35 |
| 6 a. m | 4 68 | 4.78 | 6.12 | 7.77 | 6.77 | 6.96 | 6.02 | 5.81 | 7.44 | 7.65 | 4 34 | 3.78 | 5.93 |
| 7 a. m. | 4.75 | 4.78 | 4 62 | 5.97 | 4.22 | 4.20 | 3.80 | 4 48 | 5 32 | 6.87 | 4.38 | 3.97 | 4.77 |
| 8 a. m. | 3.83 | 3.78 | 2.08 | 3.04 | 1.62 | 1.40 | 1.09 | 1 96 | 2.52 | 4.31 | 2.68 | 4.13 | 2.70 |
| 9 a. m. | 1.46 | 1.45 | −0.46 | − 0.08 | −0.60 | −0.88 | −0.87 | −0.93 | −0.56 | +0.83 | +0.34 | +2.40 | 0.19 |
| 10 a. m. | −1.26 | −0.85 | −2.57 | − 2.69 | −1.12 | −3.12 | −3.80 | −3 04 | −3.38 | −2.24 | −1.43 | −0.55 | −2.34 |
| 11 a. m. | −4.10 | −2.72 | −4.77 | − 5.65 | −5.12 | −5.68 | −6.43 | −5.45 | −6 04 | −5.02 | −3.01 | −2.76 | −4.73 |
| 12 m. | −6.32 | −4.26 | −6.38 | − 7.92 | −6.75 | −8.08 | −8.50 | −6.86 | −8.16 | −7.06 | −5.01 | −4.30 | −6.63 |
| 1 p. m. | −7.46 | −5.35 | −7.65 | − 9.46 | −8.15 | −9.36 | −8 83 | −8.23 | −9.12 | −8.24 | −6.12 | −6.14 | −7.84 |
| 2 p. m. | −7.80 | −6.06 | −8.34 | −10.42 | −8.75 | −9.00 | −9.50 | −7 86 | −9.80 | −9.28 | −5.97 | −6.30 | −8.26 |
| 3 p. m. | −7.32 | −5.80 | −8.11 | − 9.81 | −8.27 | −8.60 | −7.50 | −7 67 | −9.20 | −9.24 | −5.28 | −5.60 | −7.70 |
| 4 p. m. | −5.84 | −4.89 | −7.23 | − 8.61 | −7.86 | −7.84 | −7.17 | −6.23 | −8.40 | −8.24 | −3.85 | −3.76 | −6.66 |
| 5 p. m. | −3.32 | −3.10 | −5 65 | − 7.04 | −5.97 | −6.00 | −5 83 | −5.26 | −6.44 | −5.65 | −2.28 | −2.03 | −4.88 |
| 6 p m. | −2.06 | −1.18 | −3.46 | − 4.50 | −4.08 | −4.20 | −4.17 | −2.82 | −3.52 | −3.50 | −0 85 | −0.68 | −2.92 |
| 7 p. m. | 0.24 | −1.05 | 0.17 | − 1.69 | −2.38 | −1.92 | −1.54 | −1.44 | −1.47 | −1.24 | −0.64 | −0.31 | −1.11 |
| 8 p. m. | 0.64 | −0.43 | 0.93 | 0.27 | −0.19 | −0.04 | 0.98 | 0.33 | 0.11 | 0.13 | 0.08 | 0.20 | 0.26 |
| 9 p. m. | 1.50 | 0.28 | 1.89 | 1.77 | 1.66 | 1.96 | 3.05 | 1.59 | 1.99 | 1.16 | 0.80 | 0.69 | 1.53 |
| 10 p. m. | 2.01 | 0.57 | 3 29 | 3.31 | 2.73 | 3.20 | 3.79 | 3.02 | 3.53 | 1.90 | 1.16 | 1.20 | 2.48 |
| 11 p. m. | 2 42 | 1.19 | 4.29 | 4.23 | 3.99 | 4.20 | 4.24 | 3.79 | 4.61 | 3.24 | 1.96 | 1.58 | 3.31 |
| 12 mid. | 2.50 | 1.70 | 4.85 | 4.92 | 4.75 | 5.48 | 5.31 | 4.52 | 5.34 | 4.09 | 2.40 | 1.98 | 3.99 |
| 3 and 9 a. m. and 3 and 9 p. m.* | −0.05 | −0.22 | −0.08 | − 0.13 | 0.05 | 0.10 | 0.49 | 0.26 | −0.21 | −0.20 | −0.16 | −0.01 | −0.01 |
| 7, 2.2, (9) | −0 01 | −0.18 | 0.01 | − 0.23 | −0.05 | −0.22 | 0.10 | −0 05 | −0.12 | −0.02 | −0.02 | −0.24 | −0.11 |
| 9 and 9 | 1.48 | 0.87 | 0.72 | 0.93 | 0.53 | 0.54 | 1.09 | 0.33 | 0.72 | 1.00 | 0 57 | 1.55 | 0.80 |
| 10 and 10 | 0 38 | −0.14 | 0.36 | 0.31 | 0.81 | 0.04 | 0.00 | −0.51 | 0.11 | −0.17 | −0.13 | 0.33 | 0.12 |
| 7, 2, and 9 | −0.48 | −0.33 | −0.61 | − 0.89 | −0.96 | −0.95 | −0 88 | −0 60 | −0.83 | −0.42 | −0.29 | −0.55 | −0.65 |
| 6, 2, and 10 | −0.37 | −0.24 | 0 36 | − 0.24 | 0.25 | 0.05 | 0.10 | 0 32 | 0.39 | 0.09 | −0.16 | −0.44 | 0.01 |
| 7, 2, and 10 | −0 35 | −0.04 | −0.14 | − 0.38 | −0 60 | −0 53 | −0.64 | −0.12 | −0.32 | −0.17 | −0.18 | −0.38 | −0.32 |
| 7, 2, and 11 | −0.21 | −0.03 | 0.19 | − 0.07 | −0.18 | −0 20 | −0.49 | 0.14 | 0.04 | 0.28 | 0.09 | −0.25 | −0.07 |
| 6, 8, 2, 4, 10, and 12 | −0.09 | 0.02 | 0.13 | 0.00 | −0.12 | −0.13 | −0.08 | 0.20 | 0.11 | 0.07 | 0.13 | 0.17 | 0.03 |

* This line is for the four hours used by the Royal Society.

NOTE.—The numbers after the sign — to be subtracted, and the others to be added.

use the table, let the mean of observations at 7 a. m., for the h of April be 42°.57; apply the correction for that month and in the table, 5.97, and you have this sum, 48.54, which is the of the 24 hour observations for that month.

r the two hours, 7 and 7, in April, you would have—

$$\frac{+50.23}{2} + \frac{5\ 97 - 1.69 = 48.54}{2}, \text{ the same mean.}$$

r the three hours, 7, 2, and 9, in March, take out the three means—

$$\frac{+43.15 + 32.92}{3} = 35.42, \text{ and corrections from the tables are}$$

$$\frac{-8.34 + 1.89}{3} = -0.61.$$

The sum 34.81 is the mean of the 24 observations ıe month of March.

TE.—At the foot of the preceding table are given the corrections ›servations, made at various different hours of the days, to show earer or more remote approximations to the mean of the 24 daily :s.

e first of these is for the hours 3 and 9 a. m., and 3 and 9 p. m., ɔurs adopted by the Royal Society for obtaining the approximate temperature. These hours are convenient, except that of 3 a. m. e next corrections are derived from one-fourth of the observations . m., 2 p. m., and 2 (9) p. m., the last being twice the temper- of 9 p. m. A very near approximation is easily obtained in vay: Thus, the mean of the year, in Amherst observations—

| | | | |
|---|---|---|---|
| - - - 7 a. m., is | 42°.46 | | |
| - - - 2 p. m., is | 55°.29 | | |
| ice - - 9 p. m., is | 91°.40 | | |
| n - - - - - - - = | 189°.15 | | |
| ·ide by 4 - - - - = | 47°.29 | | |
| l the correction - = | — .11 | from the table. | |
| prox. mean - - = | 47°.18 | | |
| ın of the 24, hourly = | 47°.23 | | |
| ference - - - - = | 0°.05, | only $\frac{1}{500}$th of a degree. | |

ng the same formula for the Leith observations, the approximate differs from that of the 24 observations only $\frac{1}{900}$th degree.

| | | |
|---|---|---|
| l for Toronto | $\frac{1}{400}$ | " |
| Franklin arsenal, Pennsylvania | $\frac{11}{100}$ | " |
| Halle, about | $\frac{1}{2}$ | " |
| Padua, less than | $\frac{1}{2}$ | " |
| Gottingen | $\frac{7}{100}$ | " |
| Girard observations, not | $\frac{1}{500}$ | " |
| Brooklyn heights about the same. | | |

advantages of using the fourth part of the observation at 7 a. 2 p. m., and twice that at 9 p. m., are obvious. The preceding ıre ample illustration.

s table of corrections will have a special value in our country he locality in the heart of New England, where the observa-

tions were made. No similar table has before been derived from them. While it presents the analogies of other similar tables, it will be better adapted to a large district of our country where meteorological observations are being made systematically. Some gratification will result to Professor Snell in such an application of his laborious and scientific efforts, in this particular, in 1839.

Such tables, it is evident, avail nothing where one or more times of observation, as sunrise or sunset, have a constant change, even though they may give an approximate mean. In different latitudes sunrise has different hours, as well as sunset, and the corrections must require a far greater series of observations and far more labor. Though the four hours used at the military posts for several years give an approximate mean, no correction for the sunrise observation is yet obtained.

So great is the labor of making the observations, and of discussing them for practical purposes, that the fewest practicable hours, not exceeding three, should be adopted for the observations of meteorologists generally. Only a few observers, who are favorably situated also, can afford to make hourly observations for a year or for years; and when such have been made, as enable observers to make the corrections from prepared tables, the great object will be attained by using only three hours of observation. The last line of corrections in the preceding table is derived from six hours of observation, used for some time at the Toronto Observatory, viz: *six* and *eight* a. m., *two* and *four* and *ten* p. m., and *twelve*, or midnight. Though the corrections are very small for these six hours, they are too numerous for ordinary object or advantage. The same objection lies against the use of any four hours separated by six hours, as *one* and *seven*, both a. m. and p. m.; which, however, give very nearly the mean of 24 observations a day. Some of these hours will be very inconvenient and troublesome. Take even the hours adopted by the Royal Society, 3 and 9 a. m., and 3 and 9 p. m.; 3 a. m. is a very inconvenient hour, though the four give very nearly the mean of the daily 24 observations, as shown in the first line of particular hours.

In a series of observations of twelve years, like those in the "Army Meteorological Register" of 1856, these four hours, or any four hours, would require a million more observations than the three hours, besides increasing the labor of the reductions one-third more than is necessary to attain the same approximation to accuracy.

It is hoped that adequate evidence of the value of observations at the hours 7, 2 and 9, has been presented, and that a near approximation to the true mean is attainable. The results may be corrected, if need be, by the prepared tables.

ROCHESTER UNIVERSITY, *March* 31, 1858.

# METEOROLOGICAL OBSERVATIONS AND RESULTS.

BY J. WIESSNER.

1st. The *daily* results of mean temperature of the air in shade, as served on a farm in the District of Columbia.

2d. The *monthly* results.

3d. A trial adjustment, assuming that the mean motion of temrature may be represented by the motion of an elastic ball jumping and down.

4th. A comparison of the Washington summer with the summers Naples, Rome, Constantinople, Petersburg, and Savannah.

The probable error for the Washington series being very small, ows that the observations were made carefully and in large numr; also, that the last summer was a very regular one.

The figures in the former table for adjusting the daily observations ve the probable error $\pm$ 0°.3, so that ten years' further observaons will make them correct to the last figure.

Next, a table containing $p$ for each day of observation. By ing the three tables and the simple formula $t_0 = t_m + p\,w$, all e observations now at the end of 1857, 4,500 in number, may be computed and compared with the individual records, which will ve an average probable error of a single observation and reduction, $\pm$ 1°.4.

*Mean temperature of the air in the shade of the District of Columbia.*

| Date. | October. 1855. | November 1855. | December, 1855. | January, 1856. | February, 1856. | March, 1856. | Remarks. | December, 1856.† |
|---|---|---|---|---|---|---|---|---|
| | ° F. | ° | ° | ° | ° | ° | | ° |
| 1 | ..... | 57.4 | 39.4 | 21.4 | 28.8 | 31.8 | Mean for this period 36°.1, or after adjustment, 35°.8. Let $\mu$ be the number of weeks before or after the week, (Feb. 2—8,) + after, — before; then the adjustment gave the mean temperature for any week $\mu$ by the formula: tm. = 25°.3 + 0.130 $\mu^2$ with the probable error, $\pm$ 4°.5. The probable error of the weekly means as found from observations, was $\pm$ 1°.8. | ..... |
| 3 | ..... | 59.0 | 38.0 | 29.5 | 23.0 | 34.2 | | ..... |
| 2 | ..... | 58.3 | 42.1 | 30.4 | 10.2 | 33.3 | | ..... |
| 4 | ..... | 55.0 | 45.5 | 15.8 | 7.5 | 42.1 | | ..... |
| 5 | ..... | 48.6 | 36.7 | 18.5 | 14.0 | 30.7 | | ..... |
| 6 | 62.8 | 50.2 | 39.2 | 26.4 | 16.9 | 34.2 | | ..... |
| 7 | 46.4 | 54.3 | 40.3 | 28 2 | 33.8 | 28.8 | | ..... |
| 8 | 45.5 | 55.2 | 35.6 | 16.7 | 33 1 | 35.6 | | ..... |
| 9 | 52.6 | 48.9 | 55.2 | 5 0 | 29.0 | 19.6 | | ..... |
| 10 | 58.8 | 44.2 | 35.8 | 2.5 | 29.2 | 15.1 | | ..... |
| 11 | 60.6 | 52.2 | 28.6 | 11.0 | 33.3 | 27.9 | | ..... |
| 12 | 45.9 | 56.0 | 26.0 | 22.6 | 24.1 | 34.0 | | ..... |
| 13 | 41.4 | 59.0 | 34.7 | 30.9 | 8.6 | 29.7 | | ..... |
| 14 | 48.9 | 49 3 | 32.0 | 30.0 | 10.6 | 36.1 | | ..... |
| 15 | 58.3 | 49.6 | 39.6 | 27.5 | 26.9 | 36.3 | | ..... |
| 16 | 53.8 | 63.5 | 55.6 | 27.9 | 34.7 | 31.6 | | 28.7 |
| 17 | 46 2 | 47.0 | 45.3 | 27.1 | 19.2 | 35.4 | | 27.0 |
| 18 | 53.6 | 46 8 | 36.5 | 25.5 | 21.2 | 39.2 | | 19 8 |
| 19 | 55 4 | 41.4 | 27.9 | 27.9 | 19.4 | 34.7 | | 23.0 |
| 20 | 58.6 | 35.0 | 30.0 | 16.0 | 31.6 | 42.3 | | 35.2 |
| 21 | 60.6 | 40.1 | 35 6 | 17.1 | 31.6 | 41 9 | | 21.7 |
| 22 | 52.2 | 38.5 | 43.0 | 18.9 | 35.6 | 39.4 | | 18.5 |
| 23 | 42.1 | 35.6 | 50.2 | 17.4 | 38.0 | 40.3 | | 13.4 |
| 24 | 38.7 | 46.4 | 40.6 | 17.8 | 33.1 | 41.4 | | 22.8 |
| 25 | 38.7 | 38.5 | 33.4 | 17.6 | 34.7 | 39.9 | | 25.8 |
| 26 | 42.1 | 51.3 | 24.3 | 11.8 | 33.1 | 38.3 | | 31.9 |
| 27 | 49.1 | 42.8 | 19.2 | 23.2 | 30.6 | 36.5 | | 33.4 |
| 28 | 58.6 | 39.9 | 30.7 | 29.8 | 31.8 | * | | 41.8 |
| 29 | 51.8 | 35.3 | 23.7 | 23.4 | 33.5 | ..... | | 39.2 |
| 30 | 60.3 | 36.3 | 26.0 | 17.4 | ..... | ..... | | 32 8 |
| 31 | 55.8 | ..... | 26.0 | 15.8 | ..... | ..... | | 30.2 |
| Mean... | 51.5 | 47.8 | 36.0 | 20.7 | 26.1 | 34.5 | | 27.8 |

* Thermometer broke. † New station and thermometer, east corner District of Columbia.

A table, $[w]$, of use for the reduction of observations for temperature of the air in the shade, made at different hours of the day by the formula

$$t_o = t_m + p\,w$$

$t_o$. The observed temperature.

$t_m$. The mean of the $24h$.

$p$. A factor depending on the disposition of the atmosphere for solar heat, the mean factor of the month being unit.

$p\,w$. The correction to the mean temperature of the day to get out the observed one.

$t_m$ and $p$ are to be found for each day by the method of least squares, or by a good approximation to it, by a calculation shown on the next page.

*Example.*

Reduction of observation for temperature by the formula

$$t_0 = t_m + p\,w$$

East corner of the District of Columbia, September 1, 1857.

| | Observed. | Equations of condition. | Comp'd Δ. |
|---|---|---|---|
| | h. m. ° | | ° |
| A.M. | 5 30 $55.0 = t_m - 8.2\,p$ | $-18.4 = -10.8\,p$ | 56.9 − 1.9 |
| | 6 00 $57.8 = t_m - 7.6\,p$ | $-15.6 = -10.2\,p$ | 57.8 0.0 |
| | 7 00 $63.8 = t_m - 4.2\,p$ | $-9.6 = -6.8\,p$ | 63.0 + 0.8 |
| | 8 00 $67.8 = t_m + 0.3\,p$ | $-5.6 = -2.3\,p$ | 69.8 − 2.0 |
| | 9 00 $73.8 = t_m + 2.5\,p$ | $+0.4 = -0.1\,p$ | 73.2 + 0.6 |
| | 10 00 $77.0 = t_m + 5.4\,p$ | $+3.6 = +2.8\,p$ | 77.7 − 0.7 |
| | 11 00 $80.8 = t_m + 7.3\,p$ | $+7.4 = +4.7\,p$ | 80.6 + 0.2 |
| P.M. | 12 15 $83.0 = t_m + 9.0\,p$ | $+9.6 = +6.4\,p$ | 83.2 − 0.2 |
| | 1 15 $83.8 = t_m + 9.4\,p$ | $+10.4 = +6.8\,p$ | 83.8 0.0 |
| | 2 00 $83.8 = t_m + 9.3\,p$ | $+10.4 = +6.7\,p$ | 83.7 + 0.1 |
| | 3 00 $83.0 = t_m + 9.0\,p$ | $+9.6 = +6.4\,p$ | 83.2 − 0.2 |
| | 4 00 $81.8 = t_m + 8.0\,p$ | $+8.4 = +5.4\,p$ | 81.7 + 0.1 |
| | 5 00 $79.8 = t_m + 6.4\,p$ | $+6.4 = +3.8\,p$ | 79.2 + 0.6 |
| | 7 15 $70.5 = t_m + 0.1\,p$ | $-2.9 = -2.5\,p$ | 69.6 + 0.9 |
| | 8 15 $67.5 = t_m - 1.9\,p$ | $-5.9 = -4.5\,p$ | 66.5 + 1.0 |
| | 9 00 $66.0 = t_m - 2.8\,p$ | $-7.4 = -5.4\,p$ | 65.7 + 0.3 |
| | $73.4 = t_m + 2.6\,p$ | $131.2 = 85.5\,p$ | $^*\Sigma\,\Delta = 9.6$ |

$$^*\Sigma\,\Delta = 9.6 : 15.5 = 0.62$$
$$0.09$$

Normal eq., $\pm\,0.53$

No. of observations, 16.

Result, $p = 1.53$
$t_m = 69^\circ.4 \pm 0.13$
$\varepsilon_0 = \pm\,0.5$

*Table of w. for the reduction of temperature observations to the mean of the day by the formula* $t_o = t_{m.} + pw.$, *obtained from* 4,400 *observations, made between* 1855 *and* 1857, *by M. Wiesner, and reduced by J. Wiesner, east corner of the District of Columbia, latitude* 38° 53′. 8, *longitude* 76° 52′. 0, *height* 120 *ft.*

| Mean time, Washington. | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Mean time, Washington. | Year. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| h. | F.° | | | | | | | | | | | | | F.° |
| a. 1 | −2.5 | −4.5 | −5.0 | − 6.9 | − 9.1 | − 8.2 | −7.2 | − 6.9 | −6.6 | − 5.4 | −3.9 | −2.1 | a. 1 | −5.7 |
| 2 | −3.1 | −4.8 | −5.5 | − 7.9 | −10.1 | − 9.1 | −7.7 | − 8.2 | −6.8 | − 5.6 | −4.2 | −2.2 | 2 | −6.3 |
| 3 | −3.3 | −5.0 | −5.8 | − 9.4 | −11.0 | − 9.8 | −8.3 | − 9.0 | −7.3 | − 6.2 | −4.5 | −2.8 | 3 | −6.9 |
| 4 | −3.4 | −5.1 | −6.1 | −10.7 | −11.7 | −11.1 | −8.7 | −10.0 | −7.4 | − 6.7 | −4.6 | −3.2 | 4 | −7.4 |
| 5 | −4.1 | −5.5 | −6.4 | −11.0 | −10.2 | − 8.2 | −7.1 | − 9.8 | −7.8 | − 7.0 | −4.8 | −3.5 | 5 | −7.1 |
| 6 | −4.3 | −5.9 | −8.4 | − 9.0 | − 6.8 | − 3.6 | −4.5 | − 6.5 | −8.8 | − 8.1 | −7.2 | −5.5 | 6 | −6.6 |
| 7 | −6.0 | −7.4 | −5.8 | − 4.5 | − 2.7 | − 0.8 | −2.0 | − 2.7 | −5.6 | − 6.5 | −6.7 | −5.1 | 7 | −4.7 |
| 8 | −4.1 | −5.0 | −2.5 | − 0.3 | + 1.1 | + 1.3 | +0.6 | + 0.6 | −1.2 | − 3.4 | −4.2 | −4.0 | 8 | −1.8 |
| 9 | −1.2 | −2.0 | +1.0 | + 2.7 | + 3.8 | + 3.5 | +3.0 | + 3.3 | +1.8 | + 1.0 | −0.4 | −1.3 | 9 | +1.3 |
| 10 | +2.0 | +3.7 | +3.4 | + 5.5 | + 6.0 | + 5.7 | +5.0 | + 5.7 | +5.1 | + 4.9 | +2.7 | +1.4 | 10 | +4.3 |
| 11 | +4.4 | +4.3 | +4.8 | + 7.1 | + 8.0 | + 7.2 | +6.5 | + 7.0 | +7.7 | + 7.0 | +5.4 | +4.1 | 11 | +6.1 |
| 12 | +5.9 | +6.7 | +6.2 | + 8.4 | + 9.7 | + 8.0 | +7.5 | + 8.4 | +9.4 | + 9.1 | +7.6 | +6.6 | 12 | +7.8 |
| 1 | +6.7 | +8.0 | +7.5 | + 9.2 | +10.2 | + 8.5 | +8.0 | + 9.3 | +9.6 | +10.1 | +8.3 | +7.7 | p. 1 | +8.6 |
| 2 | +7.1 | +8.8 | +8.1 | + 9.6 | +10.4 | + 9.0 | +8.4 | + 9.1 | +9.5 | +10.6 | +8.4 | +7.4 | 2 | +8.9 |
| 3 | +5.4 | +8.1 | +8.5 | + 9.6 | +10.5 | + 9.1 | +8.0 | + 8.5 | +9.4 | +10.2 | +7.5 | +6.1 | 3 | +8.4 |
| 4 | +4.3 | +7.2 | +8.1 | + 8.9 | + 9.7 | + 8.0 | +7.3 | + 7.5 | +8.6 | + 8.4 | +5.7 | +3.4 | 4 | +7.3 |
| 5 | +2.8 | +5.3 | +6.2 | + 7.5 | + 7.9 | + 6.4 | +6.2 | + 6.0 | +6.8 | + 5.0 | +3.4 | +1.8 | 5 | +5.4 |
| 6 | +2.4 | +3.2 | +2.9 | + 4.7 | + 4.6 | + 4.1 | +3.8 | + 3.8 | +2.8 | + 1.8 | +1.8 | +0.3 | 6 | +3.0 |
| 7 | +1.2 | +0.9 | +0.9 | + 1.4 | + 0.9 | + 1.1 | +1.1 | + 1.2 | +0.2 | − 0.3 | +0.5 | −0.2 | 7 | +0.7 |
| 8 | −0.3 | 0.0 | −0.1 | − 0.6 | − 1.3 | − 1.3 | −1.1 | − 1.3 | −1.9 | − 1.8 | −0.5 | −1.1 | 8 | −0.9 |
| 9 | −1.5 | −1.1 | −1.7 | − 1.8 | − 2.3 | − 2.4 | −2.9 | − 2.5 | −3.2 | − 3.0 | −0.8 | −1.5 | 9 | −2.1 |
| 10 | −2.2 | −2.2 | −2.7 | − 3.0 | − 4.4 | − 4.5 | −4.2 | − 2.8 | −4.1 | − 4.0 | −2.2 | −1.9 | 10 | −3.2 |
| 11 | −2.9 | −3.0 | −3.4 | − 4.4 | − 5.8 | − 5.9 | −5.4 | − 4.2 | −5.0 | − 4.5 | −3.3 | −2.1 | 11 | −4.2 |
| 12 | −3.2 | −3.7 | −3.9 | − 5.9 | − 7.5 | − 7.1 | −6.3 | − 5.8 | −5.8 | − 5.2 | −3.8 | −2.3 | 12 | −5.0 |

*Mean temperature of the air, in the shade, of the District of Columbia.*

| February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. |
|---|---|---|---|---|---|---|---|---|---|---|
| 35.7 | 40.0 | 48 3 | 51.1 | 72.9 | * | 74.9 | 69.5 | 54.7 | 46.0 | 44.6 |
| 23.7 | 22.6 | 30.7 | 60.0 | 70.1 | * | 74.6 | 71.4 | 61.8 | 50.0 | 37.8 |
| 19.0 | 21.9 | 34.7 | 62.8 | 68.3 | * | 74.5 | 69.5 | 63.2 | 43.3 | 44.3 |
| 42.0 | 32.7 | 49.6 | 61.1 | 68.5 | * | 72.5 | 74.5 | 56.5 | 42.6 | 37.4 |
| 46.2 | 34.6 | 60.7 | 63.4 | 53.8 | * | 72.8 | 75.4 | 56 6 | 53.3 | 43.0 |
| 54.0 | 36.7 | 48.0 | 61.1 | 61.3 | * | 73.7 | 72 5 | 54.4 | 64 9 | 43.6 |
| 49.8 | 26.4 | 33.7 | 56.9 | 68.8 | * | 71.8 | 58.8 | 54.7 | 66.7 | 44.7 |
| 52 5 | 23 9 | 44.1 | 61.0 | 70.9 | * | 73.1 | 58.0 | 53.7 | 71.9 | 55.7 |
| 27.2 | 29.4 | 50 5 | 62.0 | 68.0 | 74.7 | 77.0 | 63.1 | 55.9 | 71.5 | 64.5 |
| 25 1 | 27.0 | 46.6 | 68.7 | 65.6 | 75.9 | 74.9 | 69.0 | 58.4 | 43.4 | 45.8 |
| 17.5 | 33.5 | 50.0 | 51.3 | 68.8 | 74.3 | 75.0 | 71.1 | 59.6 | 39.5 | 37.3 |
| 26.0 | 29.0 | 43.9 | 51.9 | 70.7 | 75.6 | 76.5 | 72.6 | 64.0 | 42.8 | 29.5 |
| 38.6 | 26.7 | 37.0 | 57.4 | 75.0 | 79.0 | 81.3 | 72.0 | 65.2 | 50.5 | 30.0 |
| 40.6 | 38.4 | 42.3 | 63.5 | 75.3 | 77.6 | 84.4 | 73.3 | 67.0 | 37.6 | 40.6 |
| 52.1 | 40.2 | 43.3 | 58.4 | 75.2 | 77.7 | 82 5 | 71.6 | 63 2 | 30.0 | 41.8 |
| 59.8 | 43.1 | 40.3 | 57.5 | 79.7 | 76.1 | 73.6 | 65.3 | 53 6 | 41.6 | 40 4 |
| 60.0 | 45.1 | 38.7 | 59.2 | 75.8 | 75.2 | 76.8 | 78.2 | 50.8 | 45.3 | 45.0 |
| 56.0 | 53.1 | 39.2 | 50.0 | 75.8 | 75.7 | 75.3 | 76.3 | 53.7 | 46.5 | 52.2 |
| 62.3 | 41.9 | 41.5 | 43.6 | 67 9 | 81.5 | 71.8 | 61.8 | 61.6 | 41.8 | 43.6 |
| 39.0 | 44.1 | 35.1 | 44.5 | 75.2 | 80.8 | 69.3 | 64.7 | 43.2 | 26.4 | 35.2 |
| 47.7 | 48.4 | 40.5 | 50.8 | 74.6 | 78.0 | 66.8 | 61.0 | 40.6 | 31.0 | 34.8 |
| 38.6 | 48.9 | 39.5 | 60.6 | † | 75.0 | 67.1 | 65.4 | 43.5 | 42.0 | 42.0 |
| 44.4 | 48.6 | 45.9 | 64.9 | † | 71.9 | 70.0 | 58.8 | 49 5 | 47.8 | 38.7 |
| 52.0 | 60.0 | 47.2 | 67.7 | † | 73.9 | 66.4 | 57.8 | 53.2 | 30.7 | 36.5 |
| 61.9 | 52.0 | 51.2 | 71.7 | † | 76.7 | 64 7 | 59.2 | 54.8 | 22.0 | 30.3 |
| 41.8 | 41.0 | 52.3 | 72.5 | † | 79.8 | 70.6 | 65.4 | 49.2 | 22.0 | 32.7 |
| 38.7 | 41.2 | 56.3 | 69.7 | † | 79.2 | 69.4 | 67.5 | 48.0 | 29.8 | 30.4 |
| 42.8 | 44.0 | 53.8 | 67.4 | † | 79.0 | 76.5 | 66.5 | 41 9 | 32.5 | 37.3 |
| ..... | 40.4 | 50.4 | 64.8 | † | 77 7 | 68.7 | 54.5 | 45.7 | 41.0 | 40.4 |
| ..... | 46 4 | 51.4 | 65.8 | † | 74.2 | 65.2 | 49.7 | 45.2 | 41.7 | 38.5 |
| ..... | 45.8 | ..... | 71.1 | † | 75.2 | 65.7 | ..... | 42.6 | ..... | 38.9 |
| 42.7 | 38.9 | 44.9 | 60.4 | 70.6 | 76.7 | 72.9 | 66.5 | 53.7 | 43.2 | 40.6 |

52°.8

* New thermometer from the Smithsonian Institution.
† Thermometer broke during the hailstorm of June 21.

*Adjustment of temperature for Washington, Summer* 1857.

| m. | | Arg. m. | Obs. ° | Assumed eq. of condition. | | | |
|---|---|---|---|---|---|---|---|
| − 3 | April | − 3 | 44.9 | $= x - 3y + 9z$ | $-18.8 = -3y + 5z$ | $-18.8 + 18.8$ | $-6.9$ |
| − 2 | May | − 2 | 60.4 | $= x - 2y + 4z$ | $-3.3 = -2y$ | $-6.9 + 3.3$ | $-10.0$ |
| | | | | | | | $-16.9$ |
| − 1 | June | − 1 | 70.6 | $= x - 1y + 1z$ | $+6.9 = -1y - 3z$ | $-13.0 + 9.2$ | $+34.1$ |
| 0 | July | 0 | 76.7 | $= x$ | $+13.0 = \quad -4z$ | $-9.2 + 2.8$ | |
| | | | | | | | $+17.2$ |
| + 1 | Aug. | + 1 | 72.9 | $= x + 1y + 1z$ | $+9.2 = +1y - 3z$ | $-10.0$ | |
| + 2 | Sept. | + 2 | 66.5 | $= x + 2y + 4z$ | $+2.8 = +2y$ | $-57.9$ | |
| + 3 | Oct. | + 3 | 53.7 | $= x + 3y + 9z$ | $-10.0 = +3y + 5z$ | | |
| | Mean..... | | 63.7 | $= x \quad + 4z$ | | | |
| | | | + 11.6 | | | | |
| | | | 75.3 | | | | |

Normal Eq.

$-57.9 = 20z$

$+17.2 = 12y$

Solution.

$z = -2.90$

$y = +1.4$

$x = 75.3$

*Washington, Summer*, $75^\circ.3\ F. + 1.4\ m - 2.90\ m^2 \pm 0^\circ.5$.

| April. | May. | June. | July. | Aug. | Sept. | Oct. | Sum of Resid. |
|---|---|---|---|---|---|---|---|
| + 75.3 | + 75.3 | + 75.3 | ..... | + 75.3 | + 75.3 | + 75.3 | + 1.7 |
| − 4.2 | − 2.8 | − 1.4 | ..... | + 1.4 | + 2.8 | + 4.2 | − 1.9 |
| − 26.1 | − 11.6 | − 2.9 | ..... | − 2.9 | − 11.6 | − 26.1 | |
| | | | | | | | 3.3 : 6 = 0.55 |
| + 45.0 | + 60.9 | + 71.0 | + 75.3 | + 73.8 | + 66.5 | + 53.4 | 0.02 |
| Resid'ls— | | | | | | | |
| − 0.1 | − 0.5 | − 0.4 | + 1.4 | − 0.9 | 0.0 | + 0.3 | ± 0.47 |

Mean.

1.4 : 5.8 = 0.24

24 30

7.2

15.5

23th

Maximum ✓ temp. July 23, 75°.4

75.3

+ 0.3

− 0.2

75.4

For comparison—

| | | | | | | |
|---|---|---|---|---|---|---|
| The summer of | Naples..... | Lat. 40°.9..... | 75°.0 | + 1.3 m | − 1.75 m² | ± 0.7 |
| | Rome..... | 41.9..... | 73.9 | + 1.3 m | − 1.69 m² | ± 0.7 |
| | Constantinople | ..... ..... .. | 77.7 | + 1.3 m | − 2.05 m² | ± 1.5 |
| | Petersburg.... | 59.8..... | 61.7 | + 0.9 m | − 2.70 m² | ± 0.8 |
| | Savannah..... | 32.1..... | 80.2 | + 0.6 m | − 1.28 m² | ± 0.7 |

## OBSERVATIONS ON NATURAL PHENOMENA.

BY STILLMAN MASTERMAN, ESQ.

WELD, MAINE, *February* 26, 1857.

DEAR SIR: Pursuant to my promise, I present to you the registry certain miscellaneous natural phenomena observed by myself during few past years, belonging principally to the departments of meteorogy and astronomy. Fragmentary and unsystematic as the obser-tions are, they can be of comparatively little value; however, as ery phenomenon of nature, even the most trifling, is worthy of a ace in the great study of the universe, and as you are desirous of llecting all registries of natural phenomena, I deem it proper to ace them at your disposal. The accompanying observations were ade with no idea of placing them before the public, but under the nviction that perhaps they might be of some use in my future scien-ic investigations. Moreover, they were conducted during fragments time which happened not to be taken up by what I considered to be ore important duties, therefore in many cases they are separated by ng intervals of time, not from the want of phenomena to observe, t from an inability to make trustworthy observations. So few ob-rvations afford very insufficient data for generalizations; however, e coincidence of certain results with those derived from more exten-e series are frequently very apparent. The following are some of e well known principles which the annexed observations tend to nfirm:

1. That shooting stars have been more numerous, at least for a few st years, on or about the 10th of August, and for a number of days th before and after that date, than at other times of the year.
2. That these meteors frequently leave long bright trains behind em in the sky.
3. That during an exhibition they commonly have one general rection of motion.
4. That exhibitions of the aurora borealis commonly commence at early hour of the evening.
5. That auroral exhibitions generally have their maximum before idnight.
6. That in our latitudes auroras have been seen in all parts of the y.
7. That the zodiacal light may be seen, in the absence of the moon, clear evenings during the months of January, February, and arch.
8. That this cone of light lies nearly in the plane of the ecliptic.
9. That the zodiacal light at times may be traced above 90° from e sun.

Yours, truly,

STILLMAN MASTERMAN.

Professor JOSEPH HENRY,
*Secretary of the Smithsonian Institution.*

## A.

## OBSERVATIONS OF SHOOTING STARS.

### WELD, FRANKLIN COUNTY, MAINE.

1847—*December* 11.—At 8*h.* 30*m.* p. m. I saw a very brilliant shooting star, which fell in the northwest. I should judge that when it was in sight I could have read the smallest print without difficulty in its light. It left a bright streak or tail of phosphorescent matter, 60° or 70° in length, which remained motionless for about 30 seconds, when it gradually vanished. The nucleus of light was apparently of three-fourths the diameter of the lunar orb, and it was about 2 seconds in passing over 70° of the celestial sphere, disappearing very near the horizon.

1849—*September* 15.—Saw three large shooting stars.

*September* 19.—Observed three shooting stars.

*September* 20.—At 8*h.* p. m. I observed a brilliant shooting star, enveloped in a nebulous mist, and having a cylindrical cometic tail, 4° in length. It shot out brilliant jets or tufts of rays from its nucleus on its foremost side, which were bent back into the tail, presenting, in miniature, the phenomena of Halley's comet, so conspicuous to astronomers, during its last return in 1835. It passed between *α Andromedæ* and *β Pegasi*, towards *Fomalhaut*, describing 60° of the heavens in about 2 seconds' time. I also observed two other shooting stars on the same evening.

*October* 3, evening.—Saw two shooting stars.

*November* 14.—In the evening I saw four shooting stars.

1850—*August* 4.—At 8*h.* 30*m.* p. m. I observed a large meteoric star. Its path was marked by a trail of light nearly 15′ in width, which disappeared in about 4 seconds' time. Its path lay from *α Cygni* to near *ε Sagittarii.*

*August* 5.—At 9*h.* p. m. saw two shooting stars. The first appeared to be as bright and to subtend nearly the same angle as the planet *Jupiter*. It passed from *Unuk al Hay* in the *Serpent* to *Arcturus* in about three-fourths of a second. The other appeared like a mere line of light described by a brilliant point, and vanished in an instant.

*August* 7.—At 9*h.* 30*m.* p. m. saw a meteoric star, apparently to pass from near *δ Draconis* by *β* of that constellation to the foot of *Hercules*. It appeared to be a streak or trail of light about 8° in length, and, if my measurement of time can be trusted, it described an arc of 30° in less than a half second.

*August* 9.—In the evening saw four shooting stars.

*August* 10.—Between 8*h.* 30*m.* and 9*h.* 20*m.* p. m. I saw thirty-four shooting stars, some of which were very brilliant. All excepting four small ones appeared to pass down the *Via Lacte*, or near to and parallel with it, from the northeast to the southwest, some as follows: 8*h.* 30*m.*, one passed from near *ε Cygni*, between *α* and *β Aquilæ*, to the *Milk Dipper* in *Sagittarius;* 8*h.* 35*m*, two passed from *Eculeus* to the head of *Capricornus;* 8*h.* 40*m.*, one passed from *η Ophiuchi* to

*Scorpio;* 8*h.* 48*m.*, one passed from *Scutum Sobieski* to *γ Sagittarii;* 8*h.* 58*m.*, observed two at the same instant, having their paths nearly parallel with each other, and about 8° apart. One passed to the east and the other to the west of the *Milk Dipper.* All of the foregoing seven meteors were accompanied by trails of light.

*August* 11 —Between 1*h.* and 2*h.* a. m., saw twenty-one shooting stars during ten minutes' observation. They passed down the *Milky Way* from *Cygnus* to *Scutum Sobieski.* A greater part of them were attended by trails of light.

*September* 1.—At about 9*h.* 10*m.* p. m., there was a brilliant meteor in the west, which approached the horizon rather slowly, describing in appearance a serpentine line. Its light was almost equal to that of the full moon, and its apparent diameter nearly 20′.

*September* 4.—Between 1*h.* and 4*h.* a. m., observed eight shooting stars. Some of them left brilliant trails.

*September* 22.—In the evening, saw two shooting stars fall in the SE.

*September* 30.—Between 8*h.* 5*m.* and 8*h.* 10*m.* p. m., saw two shooting stars fall to the southwest. Between 9*h.* 45*m.* and 10*h.* of the same evening, I saw three shooting stars pass near to the Milky Way and parallel with it.

*October* 7.—In the evening, saw three shooting stars.

*October* 9.—In the evening, saw four shooting stars.

*October* 30.—In the morning, saw a brilliant shooting star. Evening of same day, saw two shooting stars. One appeared to rise upwards from the earth. It was in the vicinity of the constellation Perseus.

*November* 1.—About 4*h.* a. m., observed two meteoric stars.

*November* 10.—8*h.* 30*m.* p. m., saw a meteoric star.

*November* 12.—6½*h.* p. m., saw a brilliant shooting star pass from near *δ Capricornus* to *β Draconis.* It left a conical trail of light, which remained visible but a little more than one second. Between 7*h.* and 8*h* , saw a shooting star.

*November* 13 —At 6*h.* 30*m.* p. m., saw a meteoric star.

*November* 20.—In the evening, I saw a swiftly moving shooting star. I judged that it moved 20° of the sphere in ¼ second.

*November* 24.—7*h.* p. m., I saw a meteoric star.

*December* 1.—In the evening, saw two shooting stars.

*December* 30.—6*h.* 38*m.* p. m., saw a brilliant meteoric star.

1851—*January* 11.—Evening, saw a small shooting star.

*January* 24.—Evening, observed two shooting stars.

*March* 31.—I saw two shooting stars.

### STILLWATER, MINNESOTA TERRITORY.

1851—*July* 19.—In evening, saw four shooting stars.

*August* 5.—In the evening, observed two shooting stars.

*August* 9.—In the evening, saw three shooting stars during fifteen minutes' observation.

*August* 10.—In the evening, saw nine shooting stars during one hour's observation.

*August* 20.—In the evening, saw four shooting stars during thirty minutes' observation.

*August* 21.—In the evening, saw three shooting stars during forty-five minutes' observation.

*August* 22.—In the evening, saw two shooting stars during fifteen minutes' observation. In the same evening I saw a shooting star apparently rise upwards. It was about three seconds in moving 45°, and made an angle with the horizon of about 30°.

*August* 26.—In the evening, saw five shooting stars during forty-five minutes' observation.

*August* 27.—In the evening, saw three shooting stars during thirty minutes' observation.

*August* 28.—In the evening, saw two shooting stars during sixty minutes' observation.

*September* 18.—In the evening, saw three shooting stars. One appeared to rise upwards more than 30° of the vertical.

*September* 23 —Saw a very brilliant shooting star.

*September* 24.—In the evening, saw two meteoric stars.

*September* 25.—In the evening, saw three shooting stars.

*September* 26.—In the evening, saw three shooting stars.

*September* 28.—In the evening, saw a meteoric star.

*September* 29.—In the evening, observed a brilliant shooting star.

### SUMMARY RECAPITULATION.

| | |
|---|---|
| Whole number of shooting stars recorded as observed previously to the beginning of the year 1852 | 173 |
| Observed previous to the year 1850 | 16 |
| Observed during the year 1850 | 100 |
| Observed during the year 1851 | 57 |

During the last five months of 1850, I usually passed an hour or two in the open air on every clear evening, and noted down all of the shooting stars that I saw, the number in each month being as follows:

| | |
|---|---|
| August | 63 |
| September | 16 |
| October | 10 |
| November | 8 |
| December | 3 |
| Total | 100 |

During 1851, I not only passed much less time in making such observations, but likewise recorded only a part of the observations made. The following is the number recorded as seen in each of the months of that year:

| | |
|---|---|
| January | 3 |
| February | 0 |
| March | 2 |
| April | 0 |
| May | 0 |

| | |
|---|---|
| June | 0 |
| July | 4 |
| August | 34 |
| September | 14 |
| October | 0 |
| November | 0 |
| December | 0 |
| Total | 57 |

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## B.

## AURORA BOREALIS AND OTHER METEORS.

### WELD, FRANKLIN COUNTY, MAINE.

*Remarkable Meteor.*

1850—*September* 30.—At 9*h.* 30*m.* p. m. I saw a remarkably strange meteor in the southern sky. Its shape was that of an elliptical zone or ring, and when first seen its centre was about 5° east and the same distance north of *Fomalhaut*, or in R. A. 23*h.* 9*m.*, and declination 25° 23′. Its longer axis lay in nearly an east and west direction. The length of its transverse axis was about 10°, and of its conjugate diameter 5°. Width of the bright belt or annular surface on the upper part of the ellipse 2°, on its lower part 1°. The northern part was very brilliant, but its southern part was dimmer. It moved slowly to the westward, and also had a *rotary* motion. At 9*h.* 45*m.* its centre was 4° north of *Fomalhaut* and on the same declination circle; being less brilliant than when first observed, but of the first noticed figure.

At 10*h.* its centre was in about R. A. 22*h.* 25*m.*, and declination 27° 23′. Its length was then nearly 15°, and width 3°. It was scarcely perceptible. It disappeared at 10*h.* 10*m.*

### STILLWATER, MINNESOTA TERRITORY.

*First Class Aurora.*

1851—*September* 29.—In the evening there was a remarkable exhibition of the *Aurora Borealis.* Soon after dark I observed a small and brilliantly white *arch,* having its point of culmination, which was about 10° above the horizon, very nearly, if not precisely, in the magnetic meridian, in the north. (The magnetic needle has a variation at this place of about 9¼° east, epoch 1850.) Soon after this, deep red *streamers*

were shot upward from the arch, 10 or 15 degrees apart, along its whole length, which converged to a focus, as it were, in the south magnetic pole of the dipping needle. One of these, which stretched like a broad band along the magnetic meridian, was of a deep crimson or almost blood color. After a short pause the northern arch began to rise slowly towards the zenith, where it was apparently dispersed. On the disappearance of the first arch in the zenith a second arch began to form, and was soon completed, in the south, just as if it was the reuniting of the first arch after passing the zenith; also concentric with the magnetic meridian, and having an altitude of 30° above the southern horizon. The extremities of this southern arch reached nearly 40° on each side of the magnetic meridian. Beneath this arch, which was about 5° in breadth, was an intensely black arch concentric with the white one. Just as the southern arch was formed, two deeply red belts, springing from the horizon at the points formerly occupied by the extremities of the northern arch, stretched themselves through the zenith, crossing each other at that point, and ran down nearly to the southern arch. These soon vanished, when a black segment of a circle was formed in the magnetic north, having its edge fringed with a silvery white. During this the southern arch had remained nearly unchangeable. Presently, alternately red and white streamers darted up from the horizon, or near to it, all around the concave, varying in width from 1° to 3° or 4° and converging towards the zenith, the southern arch still remaining as before. On the ceasing of this phenomenon the southern arch became serpentine in its course.

About two hours after this, that is about 11 o'clock, the aurora, arriving at its maximum, presented a most beautiful spectacle. The whole northern sky, from the east to the west, became thickly beset with a multitude of stud like streamers, in the north coming to within only about 15° of the horizon, but at the east and west meeting the horizon along an azimuth of nearly 30°, which all converged into a beautiful *corona* about the pole of the dipping needle. These streamers seemed all to have a sort of tremulous or wave-like motion from one side to the other in rapid succession. Shortly afterwards the corona sent out streamers down the southern sky, thus completing the auroral illumination of the whole visible concave. Just at this time there was another arch formed, in the north, that is to say in the magnetic north, stretching about 60° along the horizon, with an altitude at the culminating point of 40°, and composed of brilliant white columns diverging from the north point of the compass, shaded with black beneath. In a few minutes this arch mingled itself with the columns, converging to the pole of the dipping needle; then there followed a succession of auroral waves, passing over the whole sky, not unlike the electric flashes sometimes observed in thunder clouds. The southern arch maintained its position nearly three hours, disappearing, however, during the occurrence of the last named phenomenon. During the above auroral display the sky was clear from clouds; for as brilliant as the auroras were the brighter stars could be plainly seen through them, even where they were intensely black. The aurora continued more or less brilliant during the remainder of the night. This auroral display was characterized by all the more conspicuous

phenomena of the higher classes, such as arches, streamers, a corona, and auroral waves, the corona and waves being remarkably developed. The southern arch, however, was perhaps the most remarkable phenomenon of the exhibition.

### *Second Class Aurora Borealis.*

*December* 23.—In the evening there was an auroral exhibition. A dark arch was formed in the north, having an altitude at its culminating point of 15°, and its centre of curvature lying in the magnetic meridian. Numberless streamers shot upward from the arch to an elevation of 45°. The aurora was visible about one hour. The brilliancy of the streamers would place this exhibition in the *second* class aurora.

### *Lunar Halo.*

*December* 27.—In the evening I saw a beautiful halo around the moon. The interior diameter of the ring was about 3°, and its exterior diameter was fully 7°. The inner edge of the ring was of a deep crimson color, and its exterior a brilliant blue; while it had an intermediate annulus of yellow, bordering on an orange color. The width of the red ring was $\frac{3}{4}$°, that of the blue $\frac{3}{4}$°, and that of the yellow $\frac{1}{2}$°. The phenomenon was seen only about three or four minutes.

### *Auroras of the Third and Fourth Classes.*

1852—*January* 23.—In the evening saw a fourth class aurora borealis.

*January* 24.—In the evening I observed the aurora borealis, but the exhibition was of little importance, being of the lowest class.

*February* 7.—In the evening saw aurora borealis.

*February* 18.—In the evening there occurred quite a brilliant exhibition of the aurora borealis, with finely developed streamers. I saw a very curious auroral meteor in the constellation *Virgo*. Its shape was that of the head of a huge spear. Its foremost point was in the vicinity of *Spica*, and the two anterior points were situated, the one near $\gamma$, and the other near $\eta$ of that constellation. It remained visible only a few minutes.

*February* 19.—In the evening observed a slight auroral corruscation.

### *Parhelia.*

*February* 26.—In the morning I observed two brilliant parhelia, one on each side of the sun. The sun's altitude at the time was nearly 15°, and the mock suns were distant about 30° on each side of the real sun. On their inner, or sides next the sun, their light was of dazzling brightness, and their outer sides were tinged with the prismatic hues.

### *Minor auroras.*

*March* 9.—In the evening the sky was clear and serene. I saw an auroral arch in the north, having its centre coinciding with the magnetic meridian.

*March* 12.—In the evening, saw the aurora borealis.

*March* 17.—In the evening, saw a fourth class aurora borealis.

### *Parhelia.*

*March* 17.—Soon after sunrise I observed two parhelia, one on each side of the sun, which remained visible at least two hours.

*March* 19.—After sunrise I saw a parhelion.

## WELD, FRANKLIN COUNTY, MAINE.

### *Aurora borealis.*

*November* 10.—In the evening I saw an auroral display, consisting of a number of short streamers beset around the magnetic north. While gazing on these I beheld a meteor resembling an electric spark, which suddenly emerged from a brilliant streamer that lay in the magnetic meridian, and vanished in a moment. It appeared to have a lateral and downward movement of about 2°. Color of streamers yellowish white.

*November* 11.—In the evening I observed an auroral exhibition, which was much more brilliant than that of the 10th instant. The streamers reached a height of 45°, being intensely bright, and of a yellowish white color.

### *Solar halo.*

1853—*May* 27.—When the sun had descended about a semi-diameter of its lower limb, below the horizon in the west, I saw the following semi-circle of a solar halo. The interior diameter of the circular halo was about 8°, and its exterior diameter 18°. Its interior was crimson colored, and the several prismatic hues were depicted outward in succession. It was very brilliant, and a beautiful object for contemplation.

### *Aurora borealis.*

*June* 2.—In the evening, saw an auroral exhibition. The streamers were quite brilliant, long, and slender.

*June* 27.—At a little past 9*h.* in the evening I saw a fine aurora. It was in the form of a great arch, about 140° in length, and from 2° to 3° in breadth. The arch on the east approached within 3° of *Altair;* on or near the meridian it passed through *Corona Borealis;* and its western extremity was near $\zeta$ *Leonis.* It was very brilliant; and I

observed a nnmber of oscillations or waves pass along its meridian portion longitudinally. These waves were slow in progress, and somewhat gyratory in appearance. Only a faint illumination was observed in the north.

### *Rainbow.*

*July* 12.—When the sun had been hidden nearly fifteen minutes by the western hills, and was just on the point of passing below the plane of the horizon, I saw a beautiful rainbow. The bow was entire, and of splendid prismatic hues. Fragments of a secondary bow were seen. The bow in a few minutes showed a great preponderance of red rays, and did not disappear until the moment of sunset.

### *Aurora borealis.*

*September* 2.—In the evening, observed an auroral exhibition. At first, a dark segment of a circle appeared in the magnetic north, about 10° in altitude at its culminating point. This was soon beset around its exterior with brilliant rays of a yellowish white. These rays extending out laterally shortly formed a serpentine arch, still with the black beneath. Then a few streamers shot upwards towards the zenith. Shortly afterwards these phenomena died away, and the northern sky remained quite luminous, with here and there patches of *cirrus* in filmentous wisps. I saw several small stars through the dark auroral vapor first observed.

1854—*March* 26.—In the evening observed brilliant aurora borealis. Saw a fine auroral arch, having an altitude from the northern horizon of above 45°, and reaching from the eastern to the western horizon. Width of arch about 10°. I saw many minor exhibitions of the aurora borealis during the winter of 1853–'54.

*March* 29.—In the evening I observed a beautiful auroral meteor. It resembled the tail of a huge comet, proceeding from a nucleus about 10° north of *Spica Virginis*. It lay along below *Leo Major*, branching out into two bright streams, with a fainter dawn between, the northern branch reaching *a Canis Minoris*, and the southern terminating a few degrees north of *Canis Major*. The above was its appearance at 8*h*. 15*m*. It was very brilliant, and remained visible for sometime.

*May* 16.—In the evening saw a fine auroral arch, having an altitude of 70° in the north. It was composed of a great number of short transverse streamers 2° or 3° apart.

### *Rapid oscillations in refraction.*

*September* 4.—In the evening I observed rapid vertical oscillations in the lunar orb, when crossed horizontally by thin *cirrus* bands; the latter projected in perspective on the lunar disk, reminding one of the belts of Jupiter. She appeared to rise and fall rapidly in the vertical through about $\frac{1}{4}$° arc: corresponding fluctuations being observed in the shadows of objects in her light. A number of other persons observed the phenomenon, which lasted about ten minutes.

The altitude of the moon was about 15° ; and the *cirrus* bands crossing her disk remained apparently unchangeable and motionless. A storm of rain followed before the next morning.

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## C.

## THE ZODIACAL LIGHT.

### WELD, FRANKLIN COUNTY, MAINE.

1853—*January* 31.—On this, as well as several preceding evenings, I have observed a pyramidal column of whitish light, after the ceasing of twilight, extending along the ecliptic from the western horizon to an altitude of 40° or more, which must be the conical body of the *zodiacal light.*

1854—*February* 21.—Between 8*h.* and 9*h.* in the evening I observed the zodiacal light. Its base at the horizon was above 18° in width, and the altitude of its vertex about 35°.

1855—*January* 14.—After the ceasing of twilight I saw the cone of zodiacal light. It was very brilliant, as much so as that part of the *milky way* visible at that season. Its vertex was above 90° from the sun ; in fact, a faint illumination seemed to extend almost to the eastern horizon. Its width at its base was more than 20°. It was observed on several other evenings of the winter.

1856—*February* 2.—In the evening observed the zodiacal light; it having been seen on several evenings during the preceding month. It uniformly reaches about 90° from the sun, having an apparent width at the horizon of 40°. Sometimes a faint reflection is observed in the east.

1856—*February* 8 —After the ceasing of twilight in the evening observed the zodiacal light. Apparent width at the horizon 40°, length 10° from the sun.

1856—*March.*—I saw the pyramidal column of zodiacal light on every evening, in absence of the moon, during this month. It appears at the horizon of a width varying from 10° to 40°, and an apparent length of from 30° to 90°, and even upwards.

1857—*January.*—During this month I have frequently observed the zodiacal light. Its vertex is generally not less than 90° from the sun. On some very clear evenings a faint illumination may be traced to the distance of 170° or 180° from the sun, being visible a greater part of the night. Its width at the horizon sometimes reaches 40°. Its axis appears to lie a little above the ecliptic, or to have a small north latitude ; the amount of which is difficult of determination.

# REPORT

OF

# RECENT PROGRESS IN PHYSICS.

BY DR. JOH. MULLER,
PROFESSOR OF PHYSICS AND TECHNOLOGY IN THE UNIVERSITY OF FREIBURG.

[Translated from the German for the Smithsonian Institution.]

In revising this translation, originally made by different persons, it has been the constant aim to give as nearly and as literally as possible the exact language of the author. But one exception has been made to this rule. In the case of the citation of English philosophers reference has been made to the original memoirs, and their own language adopted, instead of that of the report, wherever it was evident that the intention had been to give the equivalent German to their English. It is due to the author, however, to state that this change has been at most but a verbal one, not material to the sense. The notice is, however, deemed necessary, because this is the only departure, save in one or two unimportant cases, from the strict rendering of the language of the text.

GEORGE C. SCHAEFFER.

## SECTION THIRD.

### THE LEYDEN JAR AND EFFECTS OF THE DISCHARGE.

[Continued from page 456, of the Report of 1856.]

### THE SECONDARY CURRENT.

§ 56. *Nature of the secondary current.*—When a battery is discharged by a long metallic wire the current in the conducting circuit wire induces a current in an adjoining closed wire conductor.

The wire which forms the conducting circuit of the battery is known as the *main wire.*

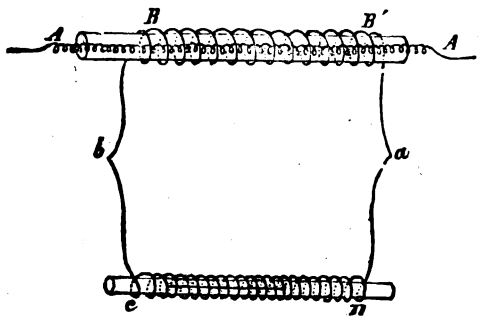
The wire in which a current is induced by the action of the current in the main wire is termed the *secondary wire.*

[The existence of the secondary current was demonstrated in a series of experiments by Professor Joseph Henry in 1838, published in the ,Transactions of the American Philosophical Society,'' vol. 6, p. 40, in 1839, a publication apparently unknown to our author.

The experiments of Riess and of Henry were therefore nearly simultaneous, as were the subsequent announcements. The article mentioned anticipates, however, much that is discussed in the following sections of this report, founded on later publications of Riess and others. Thus experiments upon screening effects, upon secondary conductors at different distances, and upon the difference in magnetism, were recited. The latter of these, in connexion with the matter in § 70, throw additional light upon the apparently abnormal development of magnetism. But the whole set of experiments, and the deductions from them, were given as a sequel to similar investigations upon secondary currents with galvanic electricity; severed from this connexion much of their value would be lost, and to reproduce the whole, together with later researches in the same line, would take up more space than can be spared in the present volume G. C. S.]

Riess proved the existence of the secondary current in the following manner, (Pog. Ann., XLVII, 55.)

Fig. 59.




Let A A, in fig. 59, be a copper wire wound spirally about a glass tube and introduced into the conducting circuit of a battery; A A consequently is the main wire. A wider glass tube is passed over the main wire, and upon it the secondary wire B B is wound, leaving its ends hanging free. The ends of a third spiral C D, also wound upon a glass tube, are to be fastened at *a* and *b*.

The connection at *b* being severed, and the ends of the wire separated a little, a spark is seen to pass at *b* when the battery, with a sufficiently strong charge, is discharged through the main wire.

This spark is a proof of the existence of the secondary current. A passage of electricity from the main to the secondary wire cannot take place if the secondary spiral be kept at a sufficient distance from the ends of the glass tube on which it is wound.

A steel sewing needle placed in the glass tube of the spiral C D, which we will call the *magnetizing spiral*, will be magnetized by the secondary current.

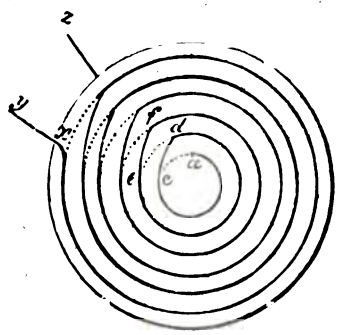
An electrical air thermometer inserted in the secondary circuit indicates heat produced by the secondary current.

Figure 59 represents the form in which Riess first arranged his experiments. Afterwards (Pogg. Ann., L, 9) he gave the spiral a more convenient form.

In a disk of wood, consisting of three pieces glued together, the diameter of which depends upon the size of the spiral to be formed, concentric grooves are to be cut and made into a spiral, by joining each circle with the following one by a curved groove; the innermost

circle is joined to the second by the groove *c d*, (figure 60,) the second to the third by *e f*, &c. In these grooves a copper wire about half a line thick is so laid as to make a spiral. One end of the wire passes through the disk at *a*, and along the under side to *z*. From *a* the wire coils out to *c*, from *c* to *d*, from *d* to *e*, *f*, &c.; *x y* is the other end of the wire thus wound in a flat spiral.

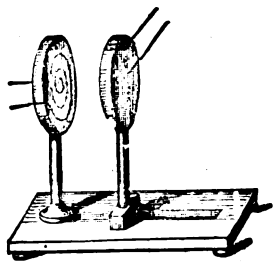
Fig. 60.




The disk is covered with a thin coat of pitch before placing the wire upon it.

The wire being fastened by the superposition of a hot metallic plate, the spaces between the rings of wire will be filled up with the pitch; a heavy heated plate laid on the disk will make the spiral perfectly level. This spiral is now blacked with coal and pressed upon another wooden disk to get the marks for a second spiral, which must correspond with the first as nearly as possible

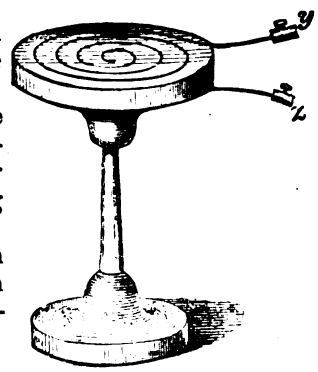
Fig. 61.



The disks are now fastened to glass supports, their planes being vertical. They are arranged upon the same stand opposite each other, and so that they can be approached and separated at pleasure. This arrangement is represented in figure 61.

Another arrangement of the flat spiral, much more convenient for many purposes, shown to me by Professor Eisenlohr, of Carlsruhe, is represented in figure 62. One of the spirals is fastened on an upright glass support in a horizontal position. The second spiral is fastened in the same manner on a glass rod, which has no foot; it is placed over the other, like the upper, over the lower condenser plate.

Fig. 62.




The distance between the spirals can be changed by placing glass plates of different thicknesses between them. For greater distances pieces of varnished wood having any desired thickness are interposed.

The ends of the wires are provided with screw clamps *z* and *y*, by means of which the spiral can be connected as may be desired.

Placing *y* and *z* of the lower spiral from one to two lines apart, and separating the two spirals by a glass plate, a spark will be seen to pass between *y* and *z* on discharging a jar, sufficiently charged, through the upper spiral. The spark is produced by the secondary current.

great distances, the heating of the lateral wire will be too little to be observed.

Riess stretched two copper wires 10 feet 6 inches long parallel to each other, (Pog. Ann., L, 7.) One of them was connected by means of copper wires 6 feet long with the circuit of the battery; the ends of the other were connected by similar wires with the platinum wire of the thermometer. By changing the distance between the axes of the parallel wires the thermometer showed *that the current generated by the straight part of the conducting circuit of the battery in the parallel wire decreases in the proportion in which the distance of the axis of the wires increases*, provided the distance of the wires at the start is not too small; for if the wires approach within a certain limit the heat produced increases in a less proportion than the distances decrease.

To obtain somewhat elevated temperatures by the secondary current, wires of great length must be used, and the management of these is very troublesome when they have to be stretched straight. Hence, when only the generation of an intense secondary current is desired, it is greatly preferable to wind the wires in a flat spiral, as already described, (144.)

The current which is excited by the main spiral in the secondary, is weaker the further the spirals are apart; but it is easily seen that between the strength of the current and the distance between the spirals there cannot be a simple proportion, for any one part of the circuit of the main spiral excites a current, not only in the curved part lying nearest to it and on the same side, but also in the more remote part of the curve, on the opposite side; the latter is indeed weaker, but it acts against the former and diminishes its effect. But the proportion of the two opposite currents evidently changes when the distance of the spirals is changed. If the starting point is from very small distances of the two spirals the strength of the secondary current at first increases more slowly, but at a greater distance far more rapidly than the increase of the distance of the spirals.

§ 62. *Action of adjoining closed conductors on the generation of the secondary current.*—Riess extended on the floor of a room three copper wires, 0.55 line thick and 10 ft. 6 in. long, parallel to each other, (Pog. Ann., L, 12,) these wires being denoted respectively by A, B, and C. The axial distance between A and B was 4.45 lines, that of B and C 2.35 lines.

The wire A was inserted in the conducting circuit of a battery; from the ends of the wire C copper wires six feet long led to the thermometer, and consequently the secondary wire C included the thermometer in its circuit. When B was removed the unit of charge gave a temperature indication of 0.135; B being restored to its place nearly the same temperature was indicated; but when the ends of B were joined by a copper wire 14 feet long only 0.094 was the temperature indicated. Hence it follows that—

*The current generated in a secondary wire by the conducting wire of a battery remains unchanged when a wire with free ends lies between the two wires; but the current is diminished if the intermediate wire is closed upon itself.*

· a greater surface, it has a less density, and consequently a slower harge, which is favorable to the production of magnetism.

. The order of the periods of decrease and increase, as well as that he reversal of the magnetism, will be changed by an alteration in secondary circuit, such as introducing wires of constantly increasing gth.

: the secondary circuit remains metallic as before, but interrupted at place, so that the current has to pass with a spark, a very remark- influence is observed on the magnetic effect; often the magnetism ı this way increased very greatly, sometimes it is weakened, and in it is changed in direction. The strongest magnetization by the ndary current, amounting nearly to saturation of the needle, has ı obtained in this manner.

. A continued change in the strength, as well as a change in the ction of the magnetism produced by the secondary spiral, takes e when, *cœteris paribus*, the length of the conducting circuit of the n spiral is continually increased.

he apparatus shown in figure 62 may be very conveniently used ıese experiments. The lower spiral may be taken for the secondary ıit, and the magnetizing coil may be introduced between $x$ and $y$ crewing its ends in the clamps.

59. *Production of heat by the secondary current.*—It has already ı mentioned that the secondary current produces thermal phenom- ; Riess has also investigated thoroughly the laws of the development eat by the lateral current.—(Pog. Ann., XLVII, 65.)

ı the conducting circuit of the secondary spiral, a magnetic spiral an electrical air thermometer were introduced. The following e contains the thermal and magnetic effects which the secondary ent produces when the surface and charge of the battery are ıged. $S$ and $q$ have the same signification as before.

| S. | Q. | Heating. | | Magnetism. |
|---|---|---|---|---|
| | | Observed. | Computed. | |
| 5 | 15 | 3.8 | 3.4 | |
| | 20 | 6.2 | 6.0 | |
| | 25 | 9.0 | 9.4 | |
| | 30 | 12.0 | 13.5 | 0 |
| 10 | 20 | 3.4 | 3.0 | 0.5 |
| | 30 | 7.0 | 6.8 | 1.5 |
| 15 | 30 | 4. | 4.5 | 1.5 |
| 20 | 30 | 3.5 | 3.4 | 4.0 |
| 25 | 30 | 2.5 | 2.7 | 2.3 |
| | 40 | 4.4 | 4.8 | —0.6 |
| 5 | 20° | 6.2 | | 8.8 |
| | 25° | 8.3 | | 2.0 |
| | 30° | 9.8 | | —3.6 |

insulating substances were interposed between the main and secondary spirals.

If solid insulators possess a greater specific inductive capacity than air a well marked distinction should be made by means of the secondary current between solid conductors and insulators of electricity. Thus, while conductors, used as interposed plates, diminish the secondary current obtained through the medium of the air, insulators, applied as interposed plates, should increase the current.

In spite of careful investigation Riess was unable to find such an increase of the secondary current by the interposition of insulating plates, such as glass, shellac, &c. The use of these plates changes in no respect the force of the secondary current, which was found just as great as though air only had been between the spirals.—(Pog. Ann., L, 18.)

§ 64. *Action of the conducting wire of a battery upon itself.*—We have seen that no electrical current can be generated by induction in a wire with free ends. The conducting wire of an electrical battery is such a wire, but since its free ends pass into broad metallic surfaces, allowing the accumulation of opposite electricities, it is necessary to examine experimentally whether one part of the wire may not have an inductive action on another part.

Riess sought to solve this question in the following manner: (Pog. Ann., L, 19.)

The two spirals, one of which had served hitherto as the main, the other as the secondary spiral, were placed at a short distance apart, and joined so as to form a single conducting wire, so that, on being introduced into the circuit of the battery, the discharge current had to pass through both.

In one case the outer end of one of the spirals was united with the central end of the other in such a way that when the discharge current in the one spiral passed from the middle to the outside, it had to pass from the middle to the outside in the other also; and, consequently, the discharge traversed the two spirals in the same direction.

The outer end of one spiral was then joined to the outer end of the other, so that the current which traversed the one from the middle to the outside went from the outside to the middle in the other; the discharge thus traversing the two spirals in opposite directions.

Now, if one part of the conducting circuit can act upon another, each spiral in the first case must cause in the other a current in the same direction as the main current, but in the last mode of connecting the spirals a current opposed to the main current; and hence, in the last case the force of the current, *cœteris paribus*, should be weaker than in the first.

The thermometer being introduced into the circuit along with the combined spirals, it indicated, under like circumstances, perfectly equal temperature, in whichever manner the spirals were united; hence it follows, *that in the discharge of a battery no part of the conducting wire acts inductively upon another part.*

§ 65. *Retardation of the electrical discharge by conductors near the conducting wire of a battery.*—Riess introduced into the conducting

circuit of a battery (Pog. Ann., XLIX, 393) a copper wire 13 feet long and 0.55 line thick, which was coiled in a flat spiral on a wooden disk six inches in diameter, covered with pitch and supported by a glass leg, as represented by fig. 61. A series of experiments, made with the circuit thus arranged, gave—

$$h = 0.43 \frac{q^2}{s}.$$

A copper plate 6 inches 10 lines in diameter and 0.33 line thick was placed parallel to the main spiral, at a distance of 2½ lines. It gave—

$$h = 0.41 \frac{q^2}{s}.$$

Then a secondary spiral exactly like the main spiral was placed parallel to it, the ends being in perfect metallic contact. This arrangement gave—

$$h = 0.42 \frac{q^2}{s}.$$

Hence, neither the copper disk nor the secondary spiral had a sensible influence on the temperature of the conducting circuit. Instead of the perfect metallic closure, a less perfect closure of the secondary spiral was made; that is, the ends of the copper wire were connected by a platinum wire 138 lines long and 0.023 in. radius. The secondary spiral thus closed being placed 5 lines distant from the main spiral the result was—

$$h = 0.32 \frac{q^2}{s};$$

when placed at the distance of only 2½ lines from the main spiral the result was—

$$h = 0.27 \frac{q^2}{s}.$$

The secondary spiral, closed by a German silver wire 460 lines long and one-twelfth line diameter, and placed 2½ lines from the main spiral, gave—

$$h = 0.17 \frac{q^2}{s}.$$

The secondary spiral, closed by a glass tube filled with water 9 inches long, gave—

$$h = 0.39 \frac{q^2}{s}.$$

We will now subject these results to a somewhat closer examination. The current in the conducting circuit, as seen above, generates a

current both in the copper plate and in the secondary spiral, but the current in the secondary spiral cannot induce a current in the main spiral, because the latter is not closed by metal, the two coatings of the jars being separated by glass. The only possible influence of the current in the secondary spiral upon that in the main spiral is some retardation of the discharge.

Now, if the closure of the secondary spiral is more perfect than that of the main spiral, the current of the former will pass more rapidly than that of the latter, and on that account no reaction of the secondary spiral can take place upon the main spiral; hence, with a more perfect closure of the secondary spiral, the temperature in the conducting circuit is found very little less than when no secondary spiral is present.

With an imperfect metallic closure of the secondary spiral the secondary current has a longer duration, and then the discharge current in the main wire finds, during its whole course, the secondary wire traversed by a current passing in the same direction, and we must assume that this is the cause of the retardation of the main current, which is indicated by the diminished temperature; by imperfect closure of the secondary spiral the temperature in the main current was reduced in the proportion of 0.43 to 0.17.

By inserting a tube of water into the secondary spiral the temperature again increases almost as much as though no secondary spiral had been present, which is well explained by the fact that, with very imperfect closure of the spiral, no sensible secondary current is generated.

The circumstance that, with quite perfect as well as with very imperfect closure of the secondary spiral, the influence on the main wire is less than for a moderately good closure, leads us to expect that, when the secondary spiral is closed by constantly increasing lengths of thin wire, at first the temperature of the main circuit will decrease, that, with a given length of the introduced wire, the influence of the secondary spiral will become a maximum, and then decrease again, and that, therefore, the elevation of temperature of the conducting circuit of the main spiral will again increase when the wire by which the secondary spiral is closed is lengthened.

This was verified by experiments which Riess made.—(Pog. Ann., LI, 177.)

Representing by 100 the temperature observed in the thermometre introduced in the conducting circuit of the main spiral, the secondary spiral being closed by a short thick copper wire, the results given by the insertion of a German silver wire 0.1517 line diameter and of different lengths, are as follows:

| Length of wire. | Temperature. |
|---|---|
| 4.8 feet. | 70 |
| 9.8 " | 55 |
| 19.7 " | 52 |
| 29.6 " | 48 |
| 39.4 " | 52 |
| 88.7 " | 61 |
| 138. " | 66 |
| 286. " | 76 |
| 582. " | 87 |
| Open. | 100 |

It is seen from this table how very rapidly at first the temperature of the circuit of the main spiral decreases with increasing length of German silver wire inserted in the circuit of the secondary spiral, and that a minimum is reached when the length of the introduced wire is 29.6 Paris feet, in which case the heating effect is only 48 per cent. of that which is observed with perfect closure of the secondary spiral. When the length of the wire exceeds 29.6 feet the temperature gradually increases again; and by lengthening the wire to 582 feet the temperature rises to 87 per cent. of that originally obtained.

*A metallic closed circuit near the conducting wire of an electrical battery acts retardingly on the discharge of the battery in proportion to the length of its closing wire. The circuit of the secondary wire being progressively prolonged its action successively increases, attains a maximum, and then decreases.*

The changes which the temperature in the main wire undergoes by lengthening the secondary wire, obey the law indicated by the last table, whether the charge of the battery be stronger or weaker; with stronger charges, as well as with weaker, the retarding effect of the secondary wire attains a maximum when the secondary spiral is closed by 29.6 feet of the above-mentioned German silver wire; and then the temperature in the main wire is 48 per cent. of that which would have been observed with an equal charge if the secondary spiral had a perfect metallic closure; but as soon as the conducting circuit of the main wire is lengthened by the introduction of a thin wire the course of the retarding effect of the lateral wire changes.

In the main conductor a platinum wire 7 inches 5 lines long and 0.023 line radius was introduced, and the results in the following table were obtained; the lateral spiral being closed by German silver wire of different lengths:

| Length of German silver wire. | Temperature of main wire. |
|---|---|
| .0 feet | 100 |
| 29.6 " | 82 |
| 49.3 " | 78 |
| 69. " | 78 |
| 237. " | 91 |
| 572. " | 99 |

We see here that, on prolonging the main conductor, the maximum effect of the secondary wire is not reached until a greater length of wire has been introduced into the secondary spiral, and moreover that the retarding effect of the secondary wire is now much less. During the previous experiments the temperature of the main wire was reduced by the maximum effect of the secondary spiral to 48 per cent.; now, the maximum effect of the secondary spiral produces only a reduction to 78 per cent. of the temperature, which would have been observed either without the secondary spiral or by one perfectly closed.

This is easy to explain. The secondary current is stronger in proportion as the part of the main wire acting on the secondary wire is greater, and to the stronger secondary current we must also attribute a greater reaction upon the discharge. The length of the main wire was the same in both series of experiments, namely, 13 feet of copper wire, which acted upon the same length of the secondary wire. In the first series these 13 feet made by far the greatest part of the circuit of the battery; in the second a platinum wire was introduced, whose retarding power was equal to a copper wire 568 feet long and 0.55 line thick; consequently, in the last case, only about one-forty-fourth part of the virtual length of the main wire acted upon the secondary spiral.

Riess caused two other spiral disks to be made, each containing 53¼ feet of copper wire two-thirds of a line in diameter. The large and small spirals were introduced into the main circuit.

The small main spiral being now placed opposite the small secondary spiral at a distance of 2 lines, the maximum retarding action of the secondary spiral took place when it was closed with 29.6 feet of German silver wire. With this maximum effect the temperature of the main circuit was 76 per cent. of that which was observed without the lateral spiral, or when it was perfectly closed.

When the large secondary spiral was opposed to the large main spiral at a distance of 2 lines, the maximum retarding action of the secondary wire occurred when the latter was closed by 79 feet of German silver wire, and in this case the temperature in the main wire was reduced by the retarding action of the secondary spiral to 25 per cent.

Finally, the two secondary spirals, properly connected, being placed opposite the two main spirals, then 138 feet of German silver wire had to be introduced into the secondary circuit to obtain the maximum retarding effect, and the temperature in the main wire was thereby reduced to 20 per cent. of that which would have been observed without a lateral spiral. From these experiments it follows that—

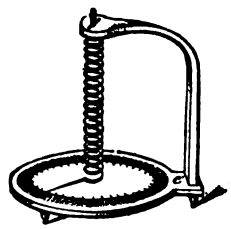
*The maximum effect of a secondary wire upon the electrical discharge attained by lengthening the secondary circuit is as much greater as the length of the main wire acting on the secondary wire is greater. But, at the same time, to attain this maximum, a proportionately longer circuit is required for the secondary wire.*

The length of the platinum wire in the air thermometer in these experiments was 143.5 lines. This wire, which is very long in proportion to the whole circuit, can never act inductively on the secondary wire; to make the longest possible part of the main wire act on the secondary spiral, the wire in the thermometer must be shortened, by which means the action of the main wire is, indeed, increased, but on the other hand the sensibility of the thermometer is diminished.

in order to shorten the platinum wire which closed the main used Berguet's metallic thermometer instead of the air ther-
;er.

;raight platinum wire 61.5 lines long and 0.04 line radius was ;d immovably in the axis of a sensitive thermometric spiral, r to that represented in fig. 63, and intro- into the circuit in a suitable manner. The ment was of course placed under a bell- The platinum wire in the axis, on being by a discharge of the battery, commu- l its heat to the spiral; the index then ;ed a number of degrees, but soon returned first position, in consequence of the rapid g caused by the large volume of air in the ass.

Fig. 63.



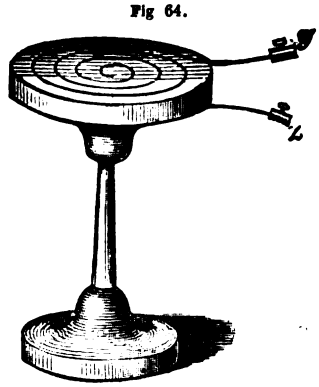
experiments with the metallic thermometer nothing new, on which account no further mention need be made n, though I could not leave this method of observing unnoticed.

. *Direction of the secondary current.*—To investigate whether rection of the lateral current changes with the distance of the ary wire from the main wire, Riess used the following method. Ann., LXXI, 351.)

insulator, which cannot be pierced by electricity, being placed ;n the free ends of the secondary spiral, no secondary current . Nevertheless the electrical equilibrium of the secondary wire royed by the act which would have produced the current, as the ing experiment shows:

;e place between the free ends of the ary spiral a thin cake of resin, so ;e two ends of the wire are opposed h other, after the discharge of the y by the main line, the two surfaces cake of resin may be distinguished ;ach other in the most decided man- Peculiar electrical figures are pro- , which, in most cases, are brought ' slightly breathing upon them. If lesired to fix the figures, it is done, wn by Lichtenberg, by strewing the es with a mixture of flowers of sul- and minium. On one of the sur- ;f the resin treated in this way there

Fig 64.



;s a red disk, with a red border, and beyond it a dark (unpow- ring, surrounded by yellow rays. On the other surface yellow ;d segments of circles are visible, embraced by a wide red ring.

rays and the ring increase with the th of the electrical excitation; with eeble excitation the rays of the first are wanting, and a simple red disk ns, which, however, is sufficiently dis- from the second figure, in which the ;g may always be recognized.

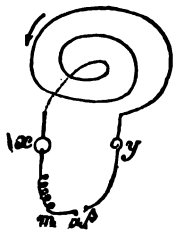
Fig. 65.

Fig. 66.

Each of these figures is composed of the two elementary forms which Lichtenberg has distinguished as positive and negative, and for this reason the direction of the secondary current cannot be deduced from these figures.

In the following experiments the ends of the secondary spiral were lengthened by copper wires, and a part of one formed a short, close coil, wound to the right. In fig. 67 let $x$ and $y$ indicate the ends of the secondary spiral to which the above-mentioned wires are attached.

Fig. 67.




To magnetize a steel needle the ends $\alpha$ and $\beta$ were put in contact, and the needle was placed in the coil, with its point toward $m$. To obtain the figures on the resin it was introduced between $\alpha$ and $\beta$. The results contained in the following table were obtained with the small main and secondary spirals, consisting of 13 feet of copper wire, already mentioned.

In the main spiral the discharge current passed in the direction indicated by the arrow. The following table shows the polarity indicated by the needle when it lay in the coil pointing towards $m$.

A glass plate was interposed between the two spirals.

| Distance of spirals. | Main wire. | Quantity of electricity. | Polarity at $m$. |
|---|---|---|---|
| *Line.* | | | |
| 1 | ---------- | 5 | N. |
| 1 | ---------- | 10 | N. |
| 1 | Lengthened ------ | 10 | S. |
| 1 | ---------- | 30 | N. |
| 1 | Lengthened ------ | 30 | S. |
| 25 | ---------- | 30 | N. |
| 25 | Lengthened ------ | 30 | S. |
| 39.5 | ---------- | 30 | S. |

It is seen that for the same direction of the main current the magnetism of the needle varies with the other circumstances, whence a difference in the directions of the secondary current might be deduced; but the resin plate being interposed between $\alpha$ and $\beta$, and the battery discharged through the main spiral under all the circumstances given in the table, fig. 65 was constantly formed on the side of the resin plate turned toward the end of the wire $\beta$—a proof that the direction of the secondary current remained the same, though the magnetism of the needle was reversed.

Riess used for producing the figure a small glass or copper plate, both sides having been covered with a thin coating of pitch or resin.

A surface of resin once used must be heated over the flame of a spirit lamp to melting before it can be employed again.

The direction of the secondary current, which, as already remarked, could not be directly determined from the figures of the resin plate, was ascertained in the following way: Two three-inch condensers were separated by a thin plate of mica; the lower one touched the

end of the wire $\alpha$; the upper was so near the end $\beta$ that, in discharging the battery, a small bluish spark passed. After discharging through the main spiral the upper plate was removed and tested by the electrometer. For a positive charge of the battery the condenser plate, which touched the end $\beta$, was found electro-negative. The rayed figure (fig. 65) is, therefore, always produced by the end charged with negative electricity; and, consequently, *the secondary current has always the same direction as the main current.*

The experiment made by Riess for ascertaining the direction of the lateral current by the decomposition of iodide of potassium failed, as he did not succeed in producing the decomposition by the secondary current.—(Pog. Ann., XLVII, 74.)

§ 67. *Deflection of the magnetic needle by frictional electricity.*—The coils of a multiplier, used for producing a deflection of the magnetic needle by a current of frictional electricity, must be very well insulated. Riess has constructed such a multiplier (Pog. Ann., XL, 348) of a copper wire 105 feet long and one-sixth line in diameter, which, covered with three coats of silk and in 260 coils, formed 5 layers on being wound upon a suitable frame. Before winding a length of the wire it was twice covered with shellac varnish, and the wrapping put on before the varnish was perfectly dry. Each layer was again varnished after wrapping.

The cylindrical astatic needles belonging to this coil were 22.5 lines long, 0.4 line in diameter, and 5 lines apart. The combined needles made one oscillation in 6.6 seconds.

One of the wire ends of such a multiplier being placed in conducting connexion with the conductor, the other with the cushion of the electrical machine, a deflection of 10 to 20 degrees could be maintained by turning.

When it is desired to deflect the needle by the discharge current of the electrical battery the discharge of course must be retarded by the insertion of bad conductors, such as moist strings, glass tubes filled with water, &c.

The latest experiments made by Riess on this point (Pog. Ann., XLVII, 535) gave results showing that the deflection of a magnetic needle by the wire which slowly discharges an electrical battery *is independent of the surface of the battery*, provided a perfect discharge of the bat-tery takes place. It is therefore immaterial to the deflection of the needle whether the same quantity of electricity is distributed over one or over several jars.

Faraday had attempted (*Experimental Researches*, 363, Pog. Ann., 29) to compare the discharge current of the electrical battery with that of a voltaic current. After obtaining a given deflection of the magnetic needle by discharging a battery he constructed a voltaic pair, which, acting $3\frac{1}{5}$ seconds, produced the same deflection as the discharge of the battery; and he concluded that the quantity of electricity yielded by the pair was equal to that accumulated in the battery.

Riess justly remarks, that this conclusion is not well founded, because the instantaneous action of the discharge current of the battery on the needle is essentially different from that of a galvanic current.

I have reported Riess' researches without interrupting the course of the narration by speaking of what has been done by others on the same subject. Let us now turn to these labors.

§ 68. *Knochenhauer's researches on the current.*—In a second article, with the title "*Experiments on Latent Electricity,*" (*Versuche über die gebundene, Elektricität*, Pog. Ann., LVIII, 391,) Knochenhauer presents the law according to which the force of the secondary current decreases when the distance from the main wire increases.

Riess has shown, as already mentioned, § 61, that the force of the secondary current decreases in the same proportion in which the axial distance of the secondary wire from that of the main wire increases.

Knochenhauer thinks this law is "evidently insufficient."

Starting, apparently, from the idea that the lateral current is a phenomenon of induction, Knochenhauer attempts to apply here *his* law.*

That a law stating the relation between action and distance, adapted to the case of spherical bodies only, in which all action can be considered as starting from a single point, cannot hold good for wires running parallel to each other does not stop Herr Knochenhauer. His law has such an astonishing elasticity that, by barely changing the coefficient, it serves for the secondary current. In his opinion there subsists between the force of the secondary current (measured by the air thermometer) and the distance of the wire the relation

$$\theta = Aa\sqrt{n}$$

in which $\theta$ denotes the temperature of the thermometer in the secondary wire, and $n$ the distance of the secondary from the main wire.

This $n$, however, is not the axial distance, but the distance of the wire in the clear, in which he assumes three lines as unity; hence the magnitude of $n$ has first to be computed from the axial distance $a$ given by Riess.

He first compares his formula with the results found by Riess. A series of these observations he arranged in the following table, with the values computed by his formula:

| *d.* | θ observed. | θ computed. | Difference. |
|---|---|---|---|
| *Lines.* | | | |
| 2.71 | 0.216 | 0.219 | + 0.003 |
| 6.78 | 0.145 | 0.143 | — 0.002 |
| 11.24 | 0.119 | 0.104 | — 0.015 |
| 16.01 | 0.081 | 0.079 | — 0.002 |
| 19.61 | 0.066 | 0.066 | 0.000 |
| 23.87 | 0.054 | 0.055 | + 0.001 |

In fact the values observed and those computed by the above formula correspond sufficiently well by making $A = 0.401$, $a = 0.489$. Indeed, the formula answers for very short distances, for which the law of Riess, on evident grounds, is no longer applicable.

But does this accordance of Knochenhauer's formula with the observa-

*See Report of 1856.

tions prove its correctness? Certainly not. When there are two constants at our disposal it is easy to invent a whole mass of formulas which would serve just as well; that is, they will accord with the few numbers observed within narrow limits, quite as closely as the limits are narrow. As a proof I propose

$$\theta = A + b \log. D;$$

the first best arbitrary formula that occurs to me. In this formula let $\theta$ denote the temperature of the secondary wire, D the axial distance of the wires. Making $A = 0.276$, and $b = 0.16$, this formula will agree with Riess' observations as well as that of Knochenhauer; as the following table shows, in which the third vertical column contains the values computed by the above formula:

| *d.* | θ observed. | θ computed. | Difference. |
|---|---|---|---|
| *Lines.* | | | |
| 2.71 | 0.216 | 0.207 | — 0.003 |
| 6.78 | 0.145 | 0.143 | — 0.002 |
| 11.24 | 0.119 | 0.107 | — 0.012 |
| 16.01 | 0.081 | 0.084 | + 0.003 |
| 19.61 | 0.066 | 0.069 | + 0.003 |
| 23.87 | 0.054 | 0.056 | — 0.002 |

In spite of this harmony between observation and computation, this formula expresses just as little as Knochenhauer's, the law according to which the force of the secondary current decreases with the distance from the main wire.

Knochenhauer has himself made a series of experiments to confirm his formula, and by which he would show that the magnitude of $a$ depends upon the conducting capacity of the main circuit, of the secondary circuit, &c. The description of the modus operandi of the experiments, how the wires were extended, &c., is exceedingly obscure, and since, I think, I have proved the inaccuracy of his formula, a further account of these experiments is unnecessary.

This memoir forms the introduction to further researches, which relate to the secondary current and currents in branched circuits. The following are the titles of the memoir on these subjects:

On the lateral current in divided conducting wires of the battery.—(Pog. Ann,. LX—LXX, 235.)

On the electrical current in divided conducting wires of the battery. (Pog. Ann., LXI, 55.)

On the diminution of the main current with divided conducting wires of the battery.—(Pog. Ann., LXII, 353.)

On the relation of the formulas which determine the development of heat by the electrical and the galvanic current.—(Pog. Ann., LXII, 207.)

Experiments on the electrical secondary current.—(Pog. Ann., LXIV, 64, and Pog. Ann., LXVI, 235.)

Determination of the compensating length of wire without the air thermometer.—(Pog. Ann., LXVII, 327.)

Solution of the problems recently proposed on branched galvanic currents, for the discharge current of the electrical battery.—(Pog. Ann., LXVIII, 136.)

On the ratio of tension in the discharge current of the electrical battery.—(Pog. Ann., LXIX, 77.)

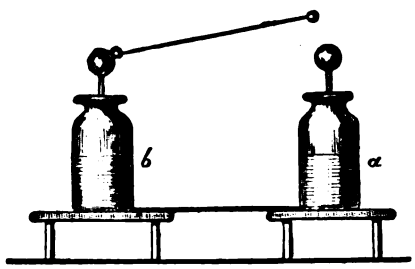
On the comparison of the electrical formula with the galvanic.—(Pog. Ann., LXIX, 421.)

The experiments mentioned in these memoirs are very badly described; the discussions inflated, confused, and full of difficult formulas, which do not lead to simple, clear, and well founded results.

Since the design of this report is to present to the reader the progress of physics, and not to weary him with criticisms on fruitless labors, I need say no more of Knochenhauer's memoir on the lateral current and kindred subjects. The criticism on the abovementioned paper suffices to justify me in this respect.

§ 69. *Charging current of the electrical battery.*—In Fig. 68 let *a* and *b* denote two electrical batteries, both of which are insulated The exterior coatings of both batteries being in metallic connexion, suppose *a* to be charged and *b* to remain uncharged.

Fig. 68.




Now, if any suitable discharger, fitted to the knob of the jar *b*, approaches the knob of the charged jar, a spark passes, the jar *a* becomes partially discharged, a part of the (e. g.) positive electricity, which was accumulated on the inner coating of *a*, passes with a spark to the inner coating of *b*, while a corresponding quantity of negative electricity passes without a spark, by the conducting connexion of the outer coatings, from *a* to *b*.

In this manner *a* is partly discharged and *b* charged; the charge of *b* is not gradual, as in ordinary charging of jars, but very rapid. Dove terms the current which, passing from the outer coating of *a* to that of *b*, charges the latter battery, the *charging current*, (*Ladungsstrom*,) and he has compared the action of this current with the action of the discharge current already amply investigated. He found the following results, (Pog. Ann., LXIV, 81:)

1. *Induction.* In the outer connecting wire a cylindrical induction spiral was introduced, surrounded by an exterior secondary spiral. The effects were the same as in the discharge stroke.

2. *Sparks.* The outer connecting wire having been interrupted, a brilliant white spark, with a loud report, appeared at the place of external interruption the instant the spark at the inner conducting wire passed. A moist thread being introduced into the inner conducting wire, the spark assumes a redish yellow color and has a feeble report; the same change is also indicated in the place of interruption of the outer connecting wire, in which there is no moist thread.

Dove found further that the "charging current" produced in the same manner as the discharge current.

3. Galvanic effects.
4. Magnetization of steel.
5. Physiological effects.
6. Penetration of bad conductors, and
7. Evolution of heat.

The needle of a galvanometer inserted in the connecting wire of the outer coatings is not affected when the inner coatings are brought into metallic contact with a white and loudly sounding spark, without the interposition of a moist thread; but it is sensibly affected when a moist thread is introduced there. The magnetizing of a steel needle placed in a spiral was produced with great effect in the first case, (without interposition,) but feebly in the second case, (with interposition.)

The contents of one of Dove's papers in Poggendorf's *Annalen*, (LIV, 305,) bearing the title, "On the current induced in magnetizing iron by means of frictional electricity," will have to be presented later, because this subject is closely related to the corresponding effects of the galvanic current.

§ 70. *Hankel's researches on magnetizing steel needles by the discharge spark of the electrical battery.*—Hankel has published two large memoirs on this subject, (Pog. Ann., LXV, 537, LXIX, 321.) In the first he speaks of Savary's observations, and then proceeds to the description of his own experiments, the results of which are as follows:

1. When the discharge stroke passes through a spiral in which a steel needle is placed, a certain minimum of charge is generally necessary to magnetize the needle. Calling the polarity which it receives by the discharge stroke of this minimum, normal, the needle will become abnormally magnetic by gradually increasiug discharges, and again normal by still stronger charges, &c. The abnormal magnetism appears with strong charges of the battery, as the pieces of wire introduced into the circuit of the battery are longer in proportion as the charge is stronger.

When in addition to the spiral and the pieces of the conducting circuit remaining constant in all the experiments, an iron wire 34 feet long and 0.1 line in diameter was introduced, abnormal magnetism was obtained with a charge 70 (measured by sparks of the measuring jar); on inserting 82 feet of the same wire a charge of 120 was required, and a wire of 154 feet required a charge of 160.

2. When a battery of more, and then one of fewer jars was used with the same conducting circuit, the battery of the less number of jars produced the abnormal period with a less charge.

An iron wire of 202 feet having been introduced, a charge of 20 with two jars produced abnormal magnetization, while by using 5 jars it was only obtained with a charge of 70, and with 9 jars, even the quantity of electricity 230, did not produce abnormal magnetization.

If with gradually increasing charges, the change from normal to abnormal magnetization is not always obtained, these periods are nevertheless not wholly wanting; for an increase and decrease of the strength of the normal magnetism is observed, and the minima of the

normal magnetization correspond in this case to the abnormal periods.

Henkel applied himself to the explanation of this phenomenon, and he lays down the following as the fundamental idea:

"It is known from Faraday's researches, that a current at its commencement generates an opposite current in a neighboring conductor; at its cessation, on the other hand, a second current which passes in the same direction with the original one. The electrical sparks must act in both ways, upon a steel needle placed near the wires, as the needle is perpendicular to the direction of the current, the planes of the currents produced in the needle are likewise perpendicular to the length of the needle, and the magnetism of the needle will be in opposite directions according as we consider it to be excited by the action of the beginning or by the cessation of the spark. But the two instants of beginning and end of electrical sparks follow each other so rapidly, that their separate effects cannot be measured; hence magnetization is the result of both of these influences."

This is essentially the fundamental idea to which Wrede (*Berzelius' Jahresbericht, deutsch von Wöhler*, 20*ster Jahrgang*, S. 119,) sought to reduce the alternate normal and abnormal magnetism of steel needles by the discharge stroke in main as well as in secondary wires.

As already intimated by Riess, (*Dove's Repertorium*, VI, 218,) this mode of explanation belongs yet to the domain of conjecture. It is possible that this is the natural process in magnetizing steel needles by the discharge stroke, but it is by no means proved.

On the whole this explanation seems very plausible; but the deduction of the particulars of the phenomenon is not at all convincing, although Hankel expresses himself quite at length upon the subject. We will do well to consider this as still an open question.

Riess remarks, in the place above cited in Dove's Repertorium, that it is better, and more for the furtherance of science, openly to confess the deficiencies of our knowledge, than to attempt to aid it with half explanation and to cover up its defects; and in this connexion he quotes a passage from Franklin's letters, which should be taken to heart by every scientific man:

"I find a frank acknowledgment of one's ignorance is not only the easiest way to get rid of a difficulty, but the likeliest way to obtain information; I think it an honest policy."

In the second memoir Hankel treats of the following points:

1. The number and magnitude of the magnetizing periods, mentioned in the first memoir.
2. The action of different spirals.
3. The action of the conducting wire upon itself.
4. The influence of the thickness of the needles.
5. The influence of the surface of the battery.
6. The changes of the alternations by obstacles interposed.
7. Special influence of particular metals, totally distinct from their conducting capacity.

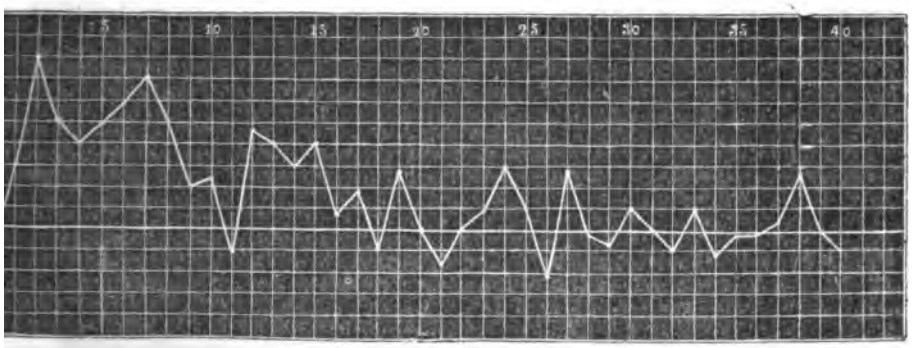
We will consider these points in succession:

1. As a magnetizing spiral, a spiral of silver wire was employed with coils so close that the introduced needle covered 31 of them.

The charge of the battery was regularly increased by 1 spark of the measuring jar, and at each discharge a new needle was magnetized; the strength of the magnetism communicated was then determined by the time which the needle required to make a given number of vibrations. A copper wire 2.63 metres long and 1.2966 millimetre diameter was used in the circuit together with the spiral.

In this manner Hankel made a series of experiments whose results are represented graphically in fig. 69. The abscissas are proportional

Fig. 69.




to the strengths of the battery charges, the ordinates to the strengths of the corresponding magnetization. The ordinates above the horizontal 0 correspond to normal, those below to abnormal magnetism.

This curve does not produce the impression of regularity; it seems rather to mask some sort of a law by irregularities which cannot be corrected by computation. But in such cases the law may be represented by averages obtained from numerous experiments.

Hankel says he repeated these experiments with the shortest circuits, to determine the position of the abnormal, or equally significant weak normal periods; from all his experiments with the same kind of needle, using the same battery of nine jars, he found these periods to occur in the following charges: 3, 6, 9, 11, 14, 16, 18, 21, 23, 26, 29, 32, 36, 40.

Hankel says, "we see that the change in the polarity returns regularly;" but I can find in this series of numbers nothing very clearly expressed, and least of all regularity. He says, moreover, that this regularity might have been more clearly represented by the introduction of fractions, but he purposely avoided them, as he had not measured them exactly, but only estimated them.

Now, what does this mean? Does not the above series of numbers represent the means of numerous experiments made under the same condition? If this is the case, why hesitate to introduce fractions? Mean values are generally computed, not observed.

To render it possible for the reader to judge of the value of his results, Hankel should have told how he arrived at the series 3, 6, 9, 11, &c.; and he should have communicated the separate series of experiments in order that one might ascertain how far the separate series differed from the mean on account of accidental disturbances.

7. The insertion of iron wires yields remarkable phenomena, producing anomalous periods of very considerable strength. Hankel found them particularly striking with thick, long iron wires. While a thick copper wire greatly weakens the magnetism, the latter is considerably strengthened by a thick iron wire. On introducing an iron wire 1.27 millimetre diameter and 131 metres long it gave, for instance, the result for a charge 6, a normal maximum 11; for a charge 36, an anomalous magnetism of the strength 9½, taking for unity the magnetizing strength adopted in constructing the above curves.

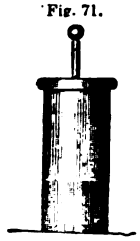
§ 71. *Leyden jars of thick glass.*—Winter, of Vienna, constructs Leyden jars which have a much greater striking distance than those in general use, and he accomplishes this by using vessels with very thick sides, (over 1 line,) and by leaving a very wide uncoated border.

Spontaneous discharge is prevented by the width of the uncoated border, and perforation of the glass is prevented by its thickness. In such jars the tension of the free electricity on the inner coating can reach a far higher degree than in the ordinary thin jars, in which, if a spontaneous discharge does not occur, a fracture of the glass is to be feared.

The mutual induction of opposite electricities of the two coatings, in consequence of the great thickness of the glass, is less perfect than with thinner glass. With the same quantity of coating, and with the same density of the free electricity on the inner coating, less electricity will be accumulated in thick glass jars than in those of thin glass; in general, therefore, the quantity of electricity which a thick glass jar can receive is less, but the tension of the free electricity on the inner coating, and consequently the striking distance, is greater.

It is to be expected that with the greater striking distance, other effects of the discharge will also suffer a change. All effects of the discharge stroke, in which it is chiefly desirable that a great quantity of electricity should be sent through a body, can be produced better with large, thin glass jars, but where the force of the shock is the main object, thick glass jars serve the purpose better; hence it appeared to me probable that the perforation of glass plates should take place much more easily with thick jars than with ordinary thin ones. Trial perfectly sustained my supposition. Formerly, in using large, thin jars, a great number of revolutions of the machine were necessary to charge the battery sufficiently for the perforation of glass, and even then the experiment did not always succeed satisfactorily; now, 20 revolutions of a very moderate electrical machine suffice to charge a thick glass jar so as to produce this effect with certainty.

Fig. 71.



The thickness of the glass jar, fig. 71, is about 1 line; each coating has a surface of about 9 square decimetres, and the uncoated border is 22 centimetres in height.

I have not studied carefully the influence of the thickness of the glass upon the effects of the discharge stroke, and only make this notice in order to draw the attention of other physicists to the point. It is much to be wished that Riess would take up this subject, since he has already labored in this field with such generally acknowledged good results.

as a long wire introduced into the circuit is extended in a straight line or wound into a spiral, will be considered below under No 6.

4. It appears in general, as Hankel infers from his experiments, that with coarse needles the phenomena do not change ; the anomalous periods occur only with stronger charges, and also appear to have lost in strength.

5. New experiments on the influence of the surface of the battery, corresponding to the previous ones, indicated that a diminution of the surface brought about the anomalous periods with decreasing charges, but so shortened them that, with a certain size of the battery, they ceased to appear as abnormal magnetization ; weak and strong normal periods only were then observed.

6. Besides the short insertion, with which the results in fig. 69 were obtained, Hankel made experiments with inserted copper wires extended in a straight line 0.23 millimetre diameter, and varying between 0.375 and 96.4 metres in length. The curves 1 and 2, fig. 70, represent the results which he obtained with the wires 12 and then 96.4 metres long. These curves seem to indicate that with longer insertions the separate small periods disappear, until at last only a large normal period is observed with stronger magnetism, after which follows a very broad negative period, (from 30 to 100,) in which, however, very weak magnetism is observed.

With reference to the disappearance of the smaller periods, these experiments do not admit, in my opinion, of any certain conclusion, because the charge of the battery was increased from 5 to 5 for the longer insertions, and from 2 to 2 for the medium, while they increased only by 1 in the shortest. Where is the guarantee that in the longer wires single periods are not passed over? Hankel preserves silence on this point.

In relation to the influence of the coils, Hankel compares the result represented by the second curve of fig. 70 with those which are given by 103 metres of the same wire wound into 70 coils. While, with straight wires, a normal period extends to 30, and is then followed by a long negative weak one, he observed, with coiled wires, 3 normal and 3 abnormal periods.

When 26 metres of a very thick (30.76 square millimetres in section) quadrangular copper wire were inserted, no change was seen in the succession of the periods, but they were generally feebler. When, in addition, 113 metres of a round (1.3 millimetre) wire were inserted, stretched in a straight line, the results represented in the third curve of fig. 70 were obtained. Nearly all reversions disappeared, the needles seemed but feebly magnetic.

When 94 metres of the thick wire were coiled into a spiral and inserted in the circuit, the results presented in the fourth curve of fig. 70 were obtained. The enfeebling of the magnetism appeared here in the thick coiled wires still more strikingly than in that extended at length.

The influence of the coiling upon the thick and the thin copper wires is evidently very different; yet, says Hankel, (page 336 of his 2d Memoir,) the influence is the same in both cases. The discussion, by means of which he seeks to prove this, is incomprehensible to me; indeed, I cannot call Hankel's reasoning in general clear and precise.

equally strong charges of the jar, are, consequently, in the ratio of 1 to 2.77, or the surfaces covered by them are as 1 to 7.67.

A plate, coated on both sides with pitch, on being brought between the insulated point and the conducting wire, and subjected to the above process, the positive figure appears on one side and the negative on the other.

When the jar was charged with *negative* electricity, the disk appeared above and the sun below, but the yellow sun in this case was only 2.2 times as large as the red disk.

The cause of the negative figures being relatively greater than in the previous experiment was owing to the excess of negative electricity, which was transmitted to the upper surface; in fact, a sun appeared on the upper side, which was 3.3 times as great as the red disk on the under side, when a positively charged jar was used in a similar experiment.

Riess has shown that the dust figures appear only when the passage of electricity on the insulating plate is accompanied by a discontinuous discharge, which may be recognized generally by a peculiar hissing. By holding the pitched plate to the knob of a charged jar a spark passes with a crashing noise; a discontinuous discharge thus takes place, and a figure appears on dusting; but the plate being placed at such a distance from the knob of the jar that a spark cannot pass, some electricity still gradually goes over, producing a continuous discharge. If the plate is dusted after standing from 30 to 70 minutes opposite the knob of the jar, a number of round spots appear irregularly distributed—yellow, if the jar had a positive, red, if a negative charge. These spots exhibit no trace of rays; they are perfectly alike in size and form for both electricities.

*Hence, electrical dust figures appear when electricity is transmitted by a discontinuous discharge to an insulating plate.*

Upon this fact Riess founds a very ingenious explanation of the difference between positive and negative dust figures. In a discontinuous discharge passing over the surface of an insulator the condensed atmosphere, which covers the surface of all bodies, is forcibly penetrated, and a part of the stratum, containing vapor of water, is projected with violence against the surface of the body.

But Faraday has shown that, if moist air impinges forcibly against any body, the latter is negatively electrified; thus, then, in this case* the surface of the plate becomes negatively electrified in consequence of the discharge which takes place over the surface; the remaining electricity of this discharge then has only to spread over a negatively electrified insulating surface.

The surface being charged with negative electricity, it spreads from the point over an insulating surface already negative; the circumstances, therefore, not being favorable for the distribution of the negative electricity the figure cannot become enlarged, and a rounded form is assumed.

The jar being positively charged, the remainder of the positive charge spreads from the point over an insulating surface negatively

* The experiments of Faraday referred to, scarcely allow of such a conclusion.—(See Report for 1856, p. 364.) G. C. S.

electrified by the discontinuous discharge; the fact that electricity is already present on the surface, acting attractingly on that issuing from the point, occasions a greater diffusion of the positive electricity; but the circumstance that the positive electricity spreading forth is partially neutralized by the presence of the negative, causes the radiating form of the positive dust figure.

To sustain this view, Riess produced a modification of the phenomenon in rarified air. On a plate covered with pitch, placed under a glass receiver, was placed the blunt end of a wire, which received a spark from a jar charged with positive electricity. With the whole pressure of the air the sun appeared on dusting the plate; but when the air was exhausted to 27½ lines pressure, only an irregular yellow speck appeared; negative electricity behaved in like manner. The difference between the positive and negative figures was no longer observed at this degree of rarifaction.

When the air was exhausted to 2 or 3 lines the end of the wire left only a point, which, *with positive electricity was red, with negative, yellow;* and consequently caused, not by the transmission of electricity to the plate, but by induction.

The penetration of the stratum of air surrounding the plate is, therefore, the origin of dust figures.

§ 74. *Dust images.*—If a stamp (as simple as possible, having a few raised letters, and for this reason printing types will answer) be placed on a single pitch plate, (so Riess calls a copper disk coated on one side only with pitch,) and electricity be communicated to the stamp, it acts inductively on the pitch surface, the latter becoming electrified at the spot where touched; and this electricity is opposite to that of the stamp, for on removing it and powdering the plate with the mixture mentioned already, a red image of the letter is obtained, if the stamp is positive; a yellow one, if negative; for the flcur of sulphur attaches itself to the positive, the minium powder to the negative spots of the resin plate.

The above described phenomenon underwent numerous modifications, according to the manner in which the stamp was electrified.

The stamp being touched by the knob of a charged Leyden jar, and then removed in an insulated condition, leaves an image as above indicated; it is, however, very little covered with dust; while the ground, by the formation of dust figures becomes yellow, if the letter is red, or red, if the letter is yellow.

The stamp being removed uninsulated, the dust figure changes, whereby the clearness of the image also suffers.

By electrifying too strongly, an actual passage of electricity in part occurs at the place where the stamp touches the plate, so that a dust image appears, partly red and partly yellow.

Then we have at the same time a dust image and dust figures. To obtain the dust image clearly, the formation of the dust figures must be avoided, which Riess accomplished in various ways.

The knob of a Leyden jar was exchanged for a four-inch ball, and the jar fastened horizontally, so that the pitch plate and the stamp could be placed under the ball; the stem of the stamp was half an inch from the ball. By the inductive action of the ball the end of the stamp

touching the pitch was electrified like the ball; too strong an accumulation of electricity was prevented by providing the stamp with a point. After the stamp had been exposed from 20 to 30 minutes to the inductive action of the ball, a clear dust image appeared without any dust figure, but irregular spots appeared in the ground, which were not of the color of the image.

Similar results were obtained when the stamp was placed for several hours in connexion with one pole of a powerful dry pile, while the electricity of the other pole was conducted off as completely as possible.

In these cases, in which generally no dust figures appeared, it was indifferent whether the stamp was insulated or not, on its removal.

The color of the irregular spots showed that they originated in the electricity actually passing from the stamp to the pitch plate at the places which admitted of a slight current. To avoid these, more ready passage to a conducting medium must be furnished for this electricity, as in the case when the dust images were produced in rarified air. Riess obtained in this manner the most perfect dust images.

The *dust figures* and *images*, just considered, are, according to Riess, *primary electrical delineations;* the figures and images now to be considered are *secondary electrical delineations.*

§ 75. *Electrical breath figures.*—The surface of glass, mica, &c., over which an electrical discharge stroke has passed, gives, by breathing upon it, peculiar ramified figures, which stand out from the surface obscured by the breath with a mirror-like lustre.

The breath figure indicates the path taken by the electrical discharge over the surface; and its form differs therefore, according to the nature of this surface. On metal, it appears as a round disk; on resin, as serpentine stripes; on mica, as fine, many times ramified lines.

The breath figure *is independent* upon the *kind* of electricity employed.

That these figures do not originate in the electricity which continues to adhere to the surface is established by the fact that they are seen on metallic surfaces, on which they appear after the breathing, as distinct circles, surrounded by more or less obscure rings; the breath figures also appear a long time after the discharge stroke has passed over the surface, or after the surface has been passed over the flame of a spirit lamp. Hence, the breath figures cannot be owing to adhering electricity; *they are to be ascribed to a change of surface which the substance used has been subjected to, by the electrical discharge.*

On a fresh surface of mica, that is on such as is obtained by a fresh cleavage, breath figures do not appear. This depends upon a peculiar property of fresh mica surface, which Riess has described in the 67th volume of Poggendorf's *Annalen*, page 354.

A clean plate of mica being breathed on, or held over evaporating water, the result is, as with all bodies, that it will be covered with a rapidly disappearing stratum of water, consisting of very small drops, which are not in contact with each other.

But when the mica has received a fresh surface by cleavage, it remains perfectly clear, shining and transparent after being breathed on.

This phenomenon is by no means owing to the fresh surface not

condensing vapor of water, for the breath causes it to show the colors of thin plates; it is consequently covered with a coherent stratum of water.

A drop of water which stands at rest on an old surface of mica at once spreads on a fresh surface, and completely covers it. Hence, a mica surface made by cleavage possesses, in consequence of its great purity, so great an attraction for the vapor of water that it condenses the water into a coherent stratum, while, had the mica been exposed a long time to the air, it would have condensed the water in separate drops.

While an old surface of mica is an excellent insulator of electricity a fresh surface discharges an electroscope in a few seconds; it acts hygroscopically by condensing the vapor of water of the atmosphere into a coherent stratum, which conducts electricity.

This remarkable peculiarity of fresh mica is preserved but a short time in the air; in a few days it may be clouded by breathing upon it.

Very powerful electrical discharges produce not only a change in the film of foreign matter covering the body, but they alter the surface of the body itself. This is the cause of the traces noticed in § 41, occasioned by the discharge spark on glass and mica (electrical colored stripes) and of the *rings of Priestley*, which occur when numerous discharges of a battery take place between a point and a polished metallic surface, whereby oxidation of the metal forms many colored concentric circles.

§ 76. *Karsten's Electrical Figures.*—The analogy which Riess describes in the VI volume of *Dove's Repertorium der Physik*, between electrical breath figures and the images of Moser, occasioned Karsten to examine whether such images could not be obtained in the electrical way.

For this purpose he placed (Pog. Ann., LVII, 492) a coin on a mirror, resting on a discharging metal plate, and caused sparks to strike from the conductor of the machine upon the coin, thence passing to the metal plate, (around the edge of the glass.) After 100 revolutions of the machine the coin was removed; the glass plate seemed wholly unchanged, but when breathed upon the image of the coin appeared distinctly.

Besides the memoir cited, Karsten has published two others, in Poggendorf's *Annalen*, (LVIII, 115, and LX, 1,) on electrical images, but as he has not succeeded in discovering their true nature, it is unnecessary to go further into the details of these memoirs; and the more, since Riess, as we shall see, has correctly ascertained the condition for producing electrical images. The report upon Riess' researches will therefore suffice to bring the facts at least, to the knowledge of the reader.

We must, however, briefly notice, by the way, Karsten's last treatise in one particular. In the beginning he adduces many experiments which have been made to explain the cause of Moser's images; besides Moser's own theory, he presents the opinion of Hunt, Know, Fizeau, Daguerre, Masson and Moore. Why is the excellent work of Waideles on this subject ignored? it appears in the first half of the 59th volume of Poggendorf's *Annalen*, and after these images had been the

occasion of numerous theoretical extravaganzas, brought us back to the basis of a rational treatment of the subject. Could Karsten not have known of this work in drawing up the papers in the 60th volume of the *Annalen?*

The explanation which Karsten gives of Moser's images is altogether inadmissible and may be easily refuted. He thinks that, because similar images can be produced by the aid of electricity, Moser's images must be of electrical origin. He thinks that "if two bodies, differing in any respect from each other, come in contact, an electrical current is produced!" and that this is the cause of Moser's images.

The generation of an *electrical current* by the contact of two heterogeneous bodies, which Karsten seems to intimate in this passage, will not be granted by the most zealous of the adherents of the contact theory; but granting even the existence of such a current, it could not produce any image, as the researches of Riess prove.

That electrical tension alone, without repeated discharges between the body and the plate, is not sufficient to produce electrical images has been shown by Know in a paper "On electrical figures and thermography," (Pog. Ann., LXI, 569,) in which he has proved the untenableness of Karsten's view as to the electrical origin of Moser's images.

The rest of the contents of Know's memoir will be mentioned subsequently in the proper place.

§ 77. *Electrical breath images.*—Riess placed a metal stamp on a shining pitch surface, and upon the stamp a small metal weight connected by a silver wire with the knob of the spark micrometer, receiving electricity directly from the conductor of the machine, while the other knob of the spark micrometer, one-half line from the first, was in conducting connexion with the ground.

The machine being now turned, electricity accumulates upon the first knob of the micrometer and upon the stamp, until a discharge takes place by the passage of a spark between the two knobs; continued turning will charge and discharge the stamp anew. The discharges follow more rapidly the closer the knobs of the spark micrometer are together.

After several revolutions of the machine the stamp may be removed, the plate breathed upon, when a shining image of the stamp shows itself on the dull ground.

It is indifferent for the success of this experiment which electricity is used.

Such images may also be produced on glass and mica, but on these substances they are often imperfect.

The simple breath image, Riess says, in caused by repeated electrical discharges taking place in opposite directions between the model and the insulating plate. The electricity communicated to the model passes over to the plate, then back to the model, when the latter is discharged by the spark micrometer; thus a motion of the same kind of electricity arises, first downward and thus upward. Since the discharges between a bad and a good conductor are never perfect, electricity, both of the kind used and the opposite kind, remain upon the

insulating plates, which are therefore in the condition to produce dust figures, often even dust images.

By simply electrifying the stamp, the arrangement being the same as for producing dust images, no breath image appears. The alternate charge and discharge of the stamp are essentially necessary for the formation of these images.

By laying a plate of mica on a pitch plate, and placing a metal stamp on this, a double discharge of the same kind of electricity takes place in the same direction in electrifying the stamp, namely, from the stamp to the upper surface of the mica, and from the under surface of the mica to the pitch plate. When a spark is communicated to the stamp from a positively charged jar, the pitch surface, when dusted, shows a yellow image of the stamp, surrounded by positive dust figures. If, therefore, in this arrangement of the stamp alternate charges and discharges are brought about, the conditions for forming *manifold breath images* are fulfilled.

A pitch surface being covered with a mica plate and a stamp placed on it, the latter was charged and discharged by the spark micrometer. After twenty revolutions the upper surface of the mica showed a perfect breath image, but the under surfaces and that of the pitch presented a most imperfect one.

These images are so frequently imperfect because pitch and mica adhere closely together in consequence of the electricity remaining after each discharge and subsequent discharges is conveyed to places which lie scattered beyond the image surface; but a metallic plate being substituted for the pitch plate, a perfect breath image is obtained on the upper and lower surfaces of the mica and on the metallic surface.

The visibility of the breath images is to be explained, according to Riess, by the fact that the surfaces are freed by electrical discharges from the film of foreign matter with which they are generally covered; and he has even proved such a cleansing of the surface by images on metal. On a perfectly insulating mica surface Riess produced a breath image, and the place where the image appeared conducted as well as a fresh surface of mica, thus showing that it had been freed from the stratum covering this spot.

In most cases breath images are produced by such a cleansing action, but they can be excited also by soiling the plate.

On a fresh mica surface an obscure image of a stamp was obtained on a shining ground. On an old surface, which electrified by forty revolutions, gave a bright breath image; one hundred revolutions produced a dull image.

The various kinds of dull breath images depend upon the condition of the plate used and of the stamp, and also upon the strength of the electricity; the clear images appear more frequently only because soiled plates and the least possible electricity are generally used.

The origin of the breath images, like that of the breath figures, is to be ascribed to a change which the electrical discharge produces in the stratum covering the plate, and consists in an increase or diminution of this stratum, according to circumstances.

A spark thrown upon a metallic surface injures it when perfectly

clean, but leaves it unchanged if it is soiled or tarnished. This is the case, in forming breath images on metals. A very small number of discharges having passed between a metallic surface and one of mica covering it, the intermitting discharge begins in the foreign stratum on the surface of the metal, and the metal remains uninjured; but when the stratum is destroyed, and the breath image is produced, and the discharges are continued, the latter then begin on the metal itself, which is thus changed. Such images, appearing without breathing, and representing some parts of the stamp in brownish colors, Riess produced on silver with from fifty to sixty revolutions.

§ 78. *Electrolytic images.*—If the blunt point of a platinum needle be placed on a paper moistened with a solution of iodide of potassium, and lying on a metallic plate connected with the ground, a brown spot will appear under the point if the needle is electrified positively, but there will be no spot if it be negatively electrified. Using positive and negative electricity one after the other in any order, the coloring remains even when the quantity of negative electricity far exceeds that of the positive.

This fact explains the electrolytic images, which Riess has invented for proving the correctness of the view presented above, on the formation of breath images by alternating discharges.

A piece of card paper, moistened on one surface with a solution of iodide of potassium, was laid on a metallic plate connected with the ground, and then covered with a plate of mica. A stamp was placed on the mica, and, being loaded with a weight of 2 to 14 ounces, was connected with the spark micrometer, whose knobs were ½ a line asunder. After twenty revolutions of the machine, positive electricity continuing to pass between the knobs, a very sharp image appeared on the paper in which the letters of the stamp appeared with a brown color.

The explanation of this phenomenon, according to the above, is easy. As in breath images, the stamp being charged with positive electricity, it passes from the lower surface of the mica to the metal plate, and thence through the moist paper; by this passage of the + E to the metal plate the iodide of potassium is decomposed; as soon as a discharge takes place between the knobs of the spark micrometer, an opposite current sets in between the metal plate and the mica; the + E now returns to the mica, and the — E through the moist disk to the metal. While the + E goes to the metal the iodide of potassium is decomposed, and this effect is not destroyed by the discharge in the opposite direction.

It is to be remarked that the passage of the + E from the mica to the metal takes place gradually, while the discharge in the opposite direction happens instantaneously.

The same experiment being repeated in the same manner with — E, no image is obtained, but only irregular brown spots.

This also may be easily explained; the negative electricity goes gradually to the metallic plate, while the passage in the opposite direction is instantaneous; thus, a greater quantity of positive electricity returns at once to the metal plate, and passes more readily to such points as lie beyond the image surface.

To obtain an image with negative electricity, care has only to be

taken that the quantity of + E which returns on the discharge between the knobs to the metal plate, shall be less, which is attained by bringing the knobs of the spark micrometer closer together.

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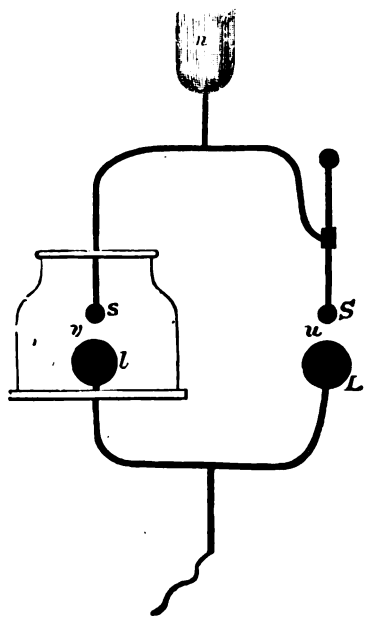
## SECTION FOURTH.

### ELECTRICAL SPARK AND BRUSH.

§ 79. *Faraday's researches on the spark and brush.*—Without going into the theoretical disquisition, mentioned in another place,* which Faraday has given upon the spark and brush, I will present here only the most important facts which he has obtained in his experiments upon these phenomena of light.—(Pog. Ann., XLVII and XLVIII.)

In order to compare the resistance which different gases presented to the passage of sparks, with the corresponding resistance of the air, Faraday used an apparatus, a sketch of which is represented in fig. 72. Two small knobs, *s* and *S*, connected with the conductor of an electrical machine, were placed opposite to two larger knobs, *l* and *L*, in conducting connexion with the ground. The diameter of the balls was as follows:

Fig. 72.




| | | |
|---|---|---|
| Ball *s*..... | 0.93 | of an inch. |
| Ball *S*..... | 0.96 | " |
| Ball *l*..... | 2.02 | " |
| Ball *L*..... | 1.95 | " |

The constant interval *v* between *s* and *l* was 0.62 of an inch; the interval *u* between *S* and *L* was variable.

It would have been better if the two small balls *s* and *S* had been perfectly equal in size, and *l* and *L* also equal; much more reliable conclusions could then have been drawn from these experiments.

The two balls *s* and *l* were placed in a receiver, which could be exhausted and then filled with different gases.

The receiver being filled with air under the pressure of the atmosphere, the sparks passed alternately at *u* and *v*, when the intervals at *u* were between 0.6 and 0.79 inches. When the interval at *u* was less than 0.6 the sparks always passed here, but if it was greater than 0.79 the sparks then always passed at *v*.

* See § 24 in the Report for 1856.

Similar results were obtained when other gases were in the receiver under the atmospheric pressure. There were two limits for the interval at *u*, between which the spark passed at one time at *u*, at another at *v*; the interval at *u* being less than the least of these limiting numbers, the spark passed always at *u*, but being greater than the greatest of these numbers it always took place at *v*. The following table indicates the limits at *u* for different gases, *v* having the constant value of 0.62 inch:

| | Smallest. | Greatest. | Mean. |
|---|---|---|---|
| Air, *s* and S | + 0.60 | 0.79 | 0.695 |
| | — 0.59 | 0.68 | 0.635 |
| Oxygen, *s* and S | + 0.41 | 0.60 | 0.505 |
| | — 0.50 | 0.52 | 0.510 |
| Nitrogen, *s* and S | + 0.55 | 0.68 | 0.615 |
| | — 0.59 | 0.70 | 0.645 |
| Hydrogen, *s* and S | + 0.30 | 0.44 | 0.370 |
| | — 0.25 | 0.30 | 0.275 |
| Carbonic acid, *s* and S | + 0.56 | 0.72 | 0.640 |
| | — 0.58 | 0.60 | 0.590 |
| Olefiant gas, *s* and S | + 0.64 | 0.86 | 0.750 |
| | — 0.69 | 0.77 | 0.730 |
| Coal gas, *s* and S | + 0.37 | 0.61 | 0.490 |
| | — 0.47 | 0.58 | 0.525 |
| Muriatic acid gas, *s* and S | + 0.89 | 1.32 | 1.105 |
| | — 0.67 | 0.75 | 0.720 |

A similar series of experiments gave for—

| | Smallest. | Greatest. | Mean. |
|---|---|---|---|
| Hydrogen } *s* and S + | 0.23 | 0.57 | 0.400 |
| Carbonic acid } *s* and S + | 0.51 | 1.05 | 0.780 |
| Olefiant gas } *s* and S + | 0.66 | 1.27 | 0.965 |

which does not coincide very well with the former results, a proof that these numbers do not afford sufficient grounds for forming a conclusion.

That within certain limits of distance at *u* the spark takes place alternately at *u* or *v*, and consequently that there is not a single permanent value of *u* for each gas, over which the spark always happens at *v*, but under always at *u*, depends upon accidents (such as particles of dust floating in the air) of which we can give no account.

If at one of the intervals a spark once passed there was generally a strong tendency in it to appear at the same interval again.

It is a remarkable circumstance that the range of distance *u* should be much less when *s* and *S* are negative than when these balls are

:ive. This is exhibited in the following table, drawn from the .er experiments. The range was—

| | *s* and *S*. | |
|---|---|---|
| | + | − |
| In air | 0.19 | 0.09 |
| oxygen | 0.19 | 0.02 |
| nitrogen | 0.13 | 0.11 |
| hydrogen | 0.14 | 0.05 |
| carbonic acid | 0.16 | 0.02 |
| olefiant gas | 0.22 | 0.08 |
| coal gas | 0.24 | 0.12 |
| muriatic acid gas | 0.43 | 0.08 |

lthough, as Faraday himself remarks, these numbers require con- 'able correction, the general result is striking and the differences :veral cases very great.

appears clearly from these experiments that different gases have equal capacities for insulation. Considering the mean values of or positive charges of *s* and *S*,) we perceive that a stratum 0.62 of ıch of—

| | | |
|---|---|---|
| xygen | insulates as well as a stratum of air, whose thicknes is | 0.505 |
| itrogen | | 0.615 |
| ydrogen | | 0.370 |
| ırbonic acid | | 0.640 |
| lefiant gas | | 0.750 |
| ›al gas | | 0.490 |
| uriatic acid gas | | 1.105 |

is, an electrical discharge passes as easily through a stratum of ).370 of an inch thick, as through one of hydrogen of 0.62 of an ; an electrical spark penetrates a stratum of air 1.105 inch thick as y as one of 0.62 of an inch of muriatic acid gas; an electrical k passes with decidedly more ease through oxygen, hydrogen, and gas than through an equal stratum of air; but muriatic acid and olefiant gas present a decidedly greater resistance to the transion of the spark than an equal thickness of air does.

milar results were obtained from later but less reliable experits.—(Pog. Ann., XLVIII, 281.)

ıe mean values of *u* are not equal with positive and negative ges of *S* and *s*; for many gases *u* has a greater mean value with sitive charge of *S* and *s* than with a negative; for other gases it e reverse; but to draw the conclusion from these experiments that y gases more readily allow the negative and others the positive ıarge through them, seems to me unwarranted, because the differ- ɜ of the above table in this respect are within the limit of errors ›servation.

ıus, according to the table given above, the mean value of *u* with sitive charge of *s* and *S* is, for—

| | |
|---|---|
| Hydrogen | 0.37 |
| Carbonic acid | 0.64 |
| Olefiant gas | 0.75 |

while Faraday obtained from a subsequent series of experiments, similarly arranged, the following values:

| | |
|---|---|
| Hydrogen | 0.40 |
| Carbonic acid | 0.78 |
| Olefiant gas | 0.96 |

Evidently the corresponding values of $u$, obtained by positive charges of $s$ and $S$, and which should be exactly equal, differ as much from each other as the corresponding values for the positive and negative charges of $s$ and $S$; from which it appears that we are justified in assigning no great value to these differences. But there is a further reason for ascribing these differences to errors of observation, arising from the fact that when air is in the receiver, and the spark accordingly takes place through air, the positive and negative mean values for $u$ are found unequal, namely: with $s$ and $S$ positive $u = 0.695$; with $s$ and $S$ negative $u = 0.635$. These differences can be ascribed only to accidental disturbances, which produce the errors of observation; for why should the spark, with a positive charge of $s$ and $S$, pass more easily through the air at $v$, and with a negative charge, more easily at $u$, also through the air? Air being in the receiver, and + and − charges imparted to $s$ and $S$, the values for $u$ would be nearly identical, unless the errors of observation were too considerable.

Faraday himself does not consider these experiments decisive in this respect, but brings forward some facts which seem to indicate some such difference between the positive and the negative discharge; making $u = 0.8$ of an inch, and filling the receiver with muriatic acid gas, the discharge always took place, with a positive discharge of $s$ and $S$, at $u$, through air, but with a negative charge of $s$ and $S$ at $v$, through the muriatic acid gas.

It also appeared that when the conductor was connected only with the muriatic acid gas apparatus the discharge occurred more readily with a negative discharge of the small ball $s$ than with a positive; for in the latter case much of the electricity passed off as brush discharge through the air from the connecting wire; but in the former case it all *seemed* to go through the muriatic acid.—(Pog. Ann., XLVII, 287.)

§ 80. *Unequal striking distances of positive and negative discharge.*—Many known phenomena coincide in showing that positive and negative discharges do not take place with equal facility. When a small ball, connected with the conductor and thus made inductive, is placed opposite a larger one, which is uninsulated, a spark is obtained twice as long, the conductor being charged positively, as when negatively charged.

Faraday has closely investigated this phenomenon, and obtained the following facts:

He passed the discharges between two balls of the respective diameters of 2 inches and 0.25 of an inch. The larger ball being connected

with the conductor, and thus made inductive, there appeared with a positive conductor—

| | |
|---|---|
| Sparks alone up to an interval of | 0.49 in. |
| Negative brush, from the small ball alone, when the interval was greater than | 0.52 " |

With a negative conductor—

| | |
|---|---|
| Sparks alone up to an interval of | 1.15 " |
| Positive brush, from the small ball alone, when the interval was greater than | 1.65 " |

Between these limits he obtained sparks and brushes mixed.

The balls were then exchanged, the small ball being connected with the conductor, and the large one uninsulated. The result with a positive conductor was—

| | |
|---|---|
| Sparks alone to an interval of | 0.4 in. |
| Negative brush alone, when the interval was greater than | 0.44 " |

From these experiments it follows that—

1. Longer sparks are obtained when the small ball is positively electrified.

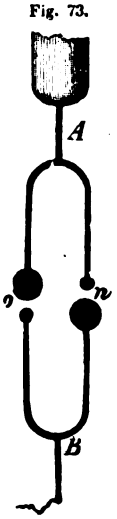
2. Longer sparks are obtained when the large ball is the inducing, and the small one the inducteous ball.

When the small ball discharges electricity in the form of brushes, they are much more numerous, and each one seems to carry off much less electrical force when the discharged electricity is negative than when positive.

This appears to indicate that a small ball requires a greater tension for discharging when positive than when negative.

To illustrate this important point, Faraday arranged an apparatus, represented in fig. 73. A fork, A, carrying a large and a small ball, was connected with the conductor of a machine; a perfectly similar fork, B, was connected with a discharging train; the small ball on each fork was placed opposite the larger one on the other. The intervals at *n* and *o* were equal. The conductor being negative, the discharge always happened at *n*, which is not surprising, because the negative charge of the small inducing ball at *n* is always stronger than the positive charge of the small inductious ball at *o*. But had the discharge taken place at *o* with a positive charge of the conductor, it would have appeared that the weak negative charge of the small inducteous ball discharges with greater facility than the far stronger positive charge of the small inducing ball at *n*, which would have been a decisive proof of the more facile discharge of negative electricity. But such a decisive result the experiments did not give; when the intervals at *n* and *o* were 0.9 of an inch, or 0.6, the discharge always took place at *n*, whether the conductor was positive or negative.

Fig. 73.




The interval *n* being made 0.79 and *o* 0.58 of an inch, if the conductor was positive, the discharge at both *n* and *o* was about equal, but if negative, the discharges mostly happened at *n*, which signified,

evidently, that the small ball discharged in the negative state somewhat more easily than in the positive, yet their result is not perfectly decisive.

A contrivance, similar to that of fig. 73, was placed inside a glass vessel, which could be filled with different gases. With equal intervals at *n* and *o*, Faraday obtained quite decided results for carbonic acid. When the conductor was positive the discharge took place mostly at *o*, when negative always at *n*; here, then, the negative discharge was decidedly the more easy, and in coal gas the preponderance of the negative discharge was just as decided. In air and in oxygen the greater facility of the negative discharge appeared somewhat doubtful; in nitrogen and in hydrogen there appeared some probability of an opposite relation.

Belli has made experiments, from which it follows that negative electricity escapes more easily into air than positive.—(Pog. Ann. XXXV, 73.)

After fastening a quadrant electrometer on a horizontal insulated conductor and electrifying it *positively*, he found, as a mean of three experiments, that the electrometer required a period of ten minutes to sink from 20° to 10°; but with negative electricity only 4.5 minutes were required.

§ 81. *Sparks in different gases.*—The phenomena attendant on sparks in different gases have been often observed and described. Faraday has made experiments on this subject also, and describes them in the twelfth series of his Experimental Researches.—(Pog. Ann. XLVII, 536.)

The gases were under the pressure of the atmosphere; the sparks passed between brass balls.

"In *air*," says Faraday, "the sparks have that intense light and bluish color which are so well known, and often have faint or dark parts in their course, when the quantity of electricity passing is not great.

"In *nitrogen* they are very beautiful, having the same general appearance as in air, but have decidedly more color, of a bluish or purple character, and, as I thought, were remarkably sonorous.

"In *oxygen* the sparks were whiter than in air or nitrogen, and I think not so brilliant.

"In *hydrogen* they had a very fine crimson color"—"very little sound was produced in this gas."

"In *carbonic acid gas* the color was similar to that of the spark in air, but with a little green in it. The sparks were remarkably irregular in form, more so than in common air.

"In *muriatic acid gas* the spark was nearly white. It was always bright throughout, never presenting those dark spots which happen in air, nitrogen, and other gases.

"In *coal gas* the spark was sometimes green, sometimes red, and occasionally one part was green and another red; black parts also occurred very suddenly in the line of the spark."

Sparks may be obtained in media, which are far denser than air—as in oil of turpentine, olive oil, resin, glass, spermaceti, water, &c.

§ 82. *The electrical brush.*—The most important facts which Faraday has obtained in reference to the brush are the following,) Pog. Ann., XLVII:)

"The *brush* and *spark* gradually pass into each other." (Faraday calls the electrical brush "a spark to air.") "Making a small ball positive by a good electrical machine with a large prime conductor, and approaching a large uninsulated discharging ball towards it, very beautiful variations from the spark to the brush may be obtained. The drawings of long and powerful sparks, given by Van Marum, (description of the large machine in Taylor's museum, German translation of 1786, Tab. III, fig. 1;) Harris, (Phila. Trans., 1834, p. 243,) and others, also indicate the same phenomena," namely, a ramification of the spark by which its transition to the brush is made.—(Faraday's Researches, § 1448.)

"If an insulated conductor, connected with the positive conductor of an electrical machine, have a metal rod 0.3 of an inch in diameter projecting from it outwards from the machine and terminating by a rounded end or a small ball, it will generally give good brushes; or if the machine be not in good action, then many ways of assisting the formation of the brush can be resorted to; thus, the hand or any *large* conducting surface may be approached towards the termination;" "or the termination may be smaller and of badly conducting matter, as wood; or sparks may be taken between the prime conductor and the secondary conductor, to which the termination giving brushes belongs;" "or the air around the termination may be rarefied."—(1425.)

That the brush is not a continuous discharge is evinced in the gradual transition of the spark to the brush. By proper proportion, in the size of the small knob to the power of the machine, brushes are obtained which show immediately that they consist of ramified sparks rapidly following each other; the machine being worked more rapidly, or with the same working of the machine substituting a still smaller discharging knob, the brush assumes a more uniform appearance, which Faraday very well describes in the following words: "A short conical bright part or root appeared at the middle part of the ball, projecting directly from it, which, at a little distance from the ball, broke out suddenly into a wide brush of pale ramifications, having a quivering motion, and being accompanied at the same time with a low, dull, chattering sound."—(1426.)

At first such a brush seems continuous, but Wheatstone has shown that it consists of successive intermitting discharges, (Philos. Trans., 1834, p. 586,) which was to be expected from the gradual transition of the spark to the brush. Faraday gives a very simple method for decomposing the apparently continuous brush into its elementary parts without the help of Wheatstone's rotating mirror; he says: "If the eye be passed rapidly, not by a motion of the head, but of the eyeball itself, across the direction of the brush, by first looking steadfastly about 10° or 15° above, and then instantly as much below it, the general brush will be resolved into a number of individual brushes."—(1427.) This method of analyzing has not succeeded perfectly in my trials.

"On using a smaller ball, the general brush was smaller, and the sound, though weaker, more continuous. On resolving the brush into its elementary parts as before these were found to occur at much shorter intervals.

"Employing a wire with a round end, the brush was still smaller, but, as before, separable into successive discharges. The sound, though feebler, was higher in pitch, being a distinct musical note."

The sound is in fact due to the recurrence of the noise of each separate discharge, and these happening at intervals nearly equal, under ordinary circumstances, cause a definite note to be head, whose pitch rises with the increased rapidity and regularity of the discharge.

"By using wires with finer terminations, smaller brushes were obtained, until they could hardly be distinguished as brushes. But as long as sound was heard the discharge could be ascertained by the eye to be intermitting; and when the sound ceased the light became continuous as a glow."

To those not accustomed to use the eye in the above-described manner, Wheatstone's apparatus with the revolving mirror is recommended. Another excellent process for analyzing the brush is to produce it on the end of a rod, held in the hand opposite to the prime conductor, and then move the rod rapidly from side to side, whilst the eye remains still.—(1428—1423.)

§ 83. *The brush in various gases.*—The experiments on the brush in various gases Faraday made with brass rods, about one quarter of an inch thick, and whose rounded ends were placed opposite each other in a glass globe of seven inches diameter, containing the gas. One of these rods was connected with the prime conductor, the other with the ground.—(Pog. Ann., XLVII, 553.)

"*Air.* Fine positive brushes are easily obtained in air, at common pressures, possessing the well known purplish light. When the air is rarefied the ramifications are very long, filling the globe; the light is greatly increased and is of a beautiful purple color, with an occasional rose tint in it.

"*Oxygen.* At common pressures the brush is very close and compressed, and of a dull whitish color. In rarefied oxygen the form and appearance are better; the color somewhat purplish, but all the characters very poor compared to those in air."

"*Nitrogen* gives brushes with great facility at the positive surface, far beyond any other gas." "They are almost always fine in form, light, and color, and in rarefied nitrogen are magnificent. They surpass the discharges in any other gas as to the quantity of light evolved."

"*Hydrogen*, at common pressures, gives a better brush than oxygen, but does not equal nitrogen; the color was greenish gray. In rarefied hydrogen the ramifications were very fine in form and distinctness, but pale in color, with a soft and velvety appearance, and not at all equal to those in nitrogen. In the rarest state of the gas the color was a pale gray green."

"*Coal gas.* The brushes were rather difficult to produce." "They were short and strong, generally of a greenish color." "In rare coal gas the brush forms were better, but the light very poor and the color gray."

"*Carbonic acid* produces a very poor brush at common pressures." "In rarefied carbonic acid the brush is better in form, but weak as to light, being of a dull greenish or purplish hue."

"*Muriatic acid gas.* It is very difficult to obtain the brush in this gas at common pressures. On gradually increasing the distance of the rounded ends the sparks suddenly ceased when the interval was about an inch, and the discharge, which was still through the gas in the globe, was silent and dark. Occasionally, a very short brush could, for a few moments, be obtained, but it quickly disappeared. Even when the intermitting spark current from the machine was used a brush was obtained with difficulty, and that very short;" "in the mean time, magnificent brushes were passing off from different parts of the machine into the surrounding air. On rarefying the gas the formation of the brush was facilitated, but it was yet of a low, squat form, very poor in light, and very similar on both the positive and negative surfaces." "On rarefying the gas still more a few large ramifications were obtained, of a pale bluish color, utterly unlike those in nitrogen."—(1456—1462.)

§ 84. *Brush in denser media.*—Electrical brushes are produced, not only in air and gases, but in far denser media. Faraday procured it in *oil of turpentine*, (1452,) "from the end of a wire going through a glass tube into the fluid, contained in a metal vessel. The brush was small, and very difficult to obtain; the ramifications were simple, and stretched out from each other, diverging very much. The light was exceedingly feeble, a perfectly dark room being required for its observation. When a few solid particles, as of dust or silk, were in the liquid, the brush was produced with much greater facility."

§ 85. *Difference of the positive and negative brush discharge.*—On this subject I extract the following remarks by Faraday:

"When the brush discharge is observed in air, at the positive and negative surfaces, there is a very remarkable difference. The difference in question used to be expressed in former times by saying that "a point charged positively gave brushes into the air, whilst the same point charged negatively gave a star." This is true only of bad conductors, or of metallic conductors charged intermittingly. If metallic points project *freely* into the air the positive and negative light upon them differ very little in appearance."

These phenomena vary exceedingly under different circumstances, as Faraday shows:

"If a metallic wire, with a rounded termination in free air, be used to produce the brushy discharge, then the brushes obtained when the wire is charged negatively are very poor and small by comparison with those produced when the charge is positive. Or if a large metal ball, connected with the electrical machine, be charged *positively*, and a fine uninsulated point be gradually brought towards it, a star appears on the point when at a considerable distance, which, though it becomes brighter, does not change its form of a star until it is close up to the ball; whereas, if the ball be charged negatively, the point, at a considerable distance, has a star on it as before; but when brought nearer,

a brush formed on it, extending to the negative ball; and when still nearer, the brush ceased and bright sparks passed."

As we have already seen, § 80, the spark discharge passes into the brush at far less distances if the surface on which the discharge begins (the small ball or the rounded end of a rod) is negative, than if it is positive; but on going further into the succession of charges we find that the positive brush passes into glow long before the negative.

"A metal rod 0.3 of an inch in diameter, with a rounded end pro-
brush. It was ascertained, both by sight and sound, that the successive
jecting into the air, was charged negatively and gave a short noisy
discharges were very rapid in their recurrence, six or seven times more
numerous than when the rod was charged positively to an equal
degree."

"When the rod was positive it was easy, by working the machine a little quicker, to replace the brush by a glow, but when it was negative no efforts could produce this change."—(1468.)

"A point opposite the negative brush exhibited a star, and, as it was approximated, caused the size and sound of the brush to diminish, and at last to cease, leaving the negative end silent and dark, yet effective as to discharge."—(1469.)

"When the round end of a smaller wire was advanced towards the negative brush, it (becoming positive by induction) exhibited the quiet glow at eight inches distance, the negative brush continuing. When nearer, the pitch of the sound of the negative brush *rose*, indicating quicker intermittances; still nearer the positive end threw off ramification and distinct brushes, at the same time the negative brush contracted in its lateral direction and collected together, giving a peculiar, narrow, longish brush, in shape like a hair pencil; the two brushes existing at once, but were very different in their form and appearance, and especially in the more rapid recurrence of the negative discharges than of the positive. On using a smaller positive wire for the same experiment the glow first appeared in it and then the brush, and the two at one distance became exceedingly alike in appearance." (1470.)

"In *air* the superiority of the positive brush is well known. In *nitrogen* it is as great or even greater than in air. In *hydrogen* the positive brush loses a part of its superiority, not being so good as in nitrogen or air, whilst the negative brush does not seem injured. In *oxygen* the positive brush is compressed and poor, whilst the negative did not become less; the two were so alike that the eye frequently could not tell one from the other. In *coal gas* the brushes are difficult of production;" "and the positive not much superior to the negative, either at common or low pressure. In *carbonic acid* this approximation of character also occurred. In *muriatic acid gas* the positive brush was very little better than the negative."—(1476.)

§ 86. *Glow discharge.*—The glow "seems to depend upon a quick and almost continuous charging of the air close to and in contact with the conductor."—(Faraday's Researches, 1526.) Faraday was never able to separate it into visible intermitting elementary discharges. The glow is produced by—

1st. *Diminution of the charging surface.*—At the end of a metal rod

with a blunt conical point, a phosphorescent continuous glow is obtained the more readily as the point is finer.

2d. *Increase of power in the machine.*—Rounded ends, which give only brushes when the machine is in weak action, give the glow readily when the machine is in good order.

3d. *Rarefaction of the air.*—A brass ball 2½ inches in diameter being made positively inductive in an air-pump receiver, became covered with glow in part, "when the pressure was reduced to 4.4 inches. By a little adjustment the ball could be covered all over with this light. Using a brass ball 1.25 inch in diameter, and making it inducteously positive by an inductive negative point, the phenomena were exceedingly beautiful. The glow came over the positive ball, and gradually increased in brightness until it was at least very luminous; and it also stood up, like a low flame, half an inch or more in height."—(1529.)

The *negative glow* is difficult to obtain in air at common pressures; "and it is as yet questionable whether, even on fine points, what is called the negative star is not a very reduced, but still intermitting brush, or a glow."—(1530.)

In rarefied air the negative glow can easily be obtained. If the rounded ends of two metal rods about 0.2 of an inch in diameter are about four inches apart in rarefied air, the glow can be easily obtained on both rods, covering not only the ends but an inch or two of the part behind. Balls are also covered with the negative glow in rarefied air, whether their surface is inductive or inducteous.—(1531.)

The glow occurs in all the gases examined for it by Faraday. He thought he obtained it also in oil of turpentine, though it was very dull and small.—(1534.)

"The glow is always accompanied by a wind, proceeding either directly out from the glowing part or directly towards it; the former being the most general case." If the arrangements are made so that the ready and regular access of air to a part exhibiting the glow be interfered with or prevented the glow then disappears.—(1535.)

Frequently it is possible to change the brush given by the end of a rod into a glow, by simply aiding the formation of a current of air at its extremity.—(1535.)

§ 87. *Dark discharge.*—If to the rounded end of a metallic rod projecting from the prime conductor of a machine a similar rod be held at a little distance, it is easy to obtain the appearance of light at the ends of both rods, while the intervening space between the positive and negative light remains dark; besides this familiar phenomenon, Faraday notices a very remarkable case of dark discharge.

"Two brass rods, 0.3 of an inch in diameter, entering a glass globe on opposite sides, had their ends brought into contact, and the air about them very much rarefied. A discharge of electricity from the machine was then made through them, and while that continued the ends were separated from each other. At the moment of separation a continuous glow came over the end of the negative rod, the positive termination remaining quite dark. As the distance was increased a purple stream or haze appeared on the end of the positive rod, and proceeded directly onward towards the negative rod, elongating as the

interval was enlarged, but never joining the negative glow, there being always a short dark space between. This space, of about one-sixteenth or one-twentieth of an inch was apparently invariable in its extent and its position relative to the negative rod; nor did the negative glow vary. Whether the negative ends were inductive or inducteous the same effect was produced."

Similar phenomena were obtained with balls instead of the rounded ends of rods.

§ 88. *Convective discharge.*—The dielectric being penetrated by the spark, the brush, and also by the glow, Faraday calls this form of discharge the *disruptive discharge.* With the brush, and still more with the glow, another form of discharge appears, making itself manifest by the so-called electrical wind. This is owing to the particles of the dielectric, in close contact with the charged conductor, (on the end of the electrified rod,) receiving an electrical charge, in consequence of which they are repelled; and by a repetition of this action the conductor is discharged.

"Why a point should be so exceedingly favorable to the production of currents is evident. It is at the extremity of the point that the intensity necessary to charge the air is first acquired; it is from thence that the charged particle recedes; and the mechanical force which it impresses on the air to form a current is in every way favored by the shapes and position of the rod whose point forms the termination."—(1573.)

Particles of dust floating in the air favor the escape of electricity.

"On using oil of turpentine as the dielectric, the action and course of small conducting, carrying particles in it, can be well observed."

"A very striking effect was produced on oil of turpentine, which, whether it was due to the carrying power of the particles in it, or to any other action of them, is, perhaps, as yet doubtful. A portion of that fluid in a glass vessel had a large uninsulated silver dish at the bottom, and an electrified metal rod, with a round termination, dipping into it at the top. The insulation was very good. The rod end, with a drop of gum water attached to it, was then electrified in the fluid; the gum water soon spun off in fine threads, and was quickly dissipated through the oil of turpentine. By the time that four drops had in this manner been commingled with a pint of the dielectric, the latter had lost by far the greatest portion of its insulating power;" "the fluid was slightly turbid. Upon being filtered through paper only, it resumed its first clearness, and now insulated as well as before."—(1571.)

"Conducting fluid terminations, instead of rigid points, illustrate in a very beautiful manner the formation of the currents, with their effects and influence in exalting the conditions under which they were commenced. Let the rounded end of a brass rod, 0.3 of an inch, or thereabouts, in diameter, point downwards in free air; let it be amalgamated and have a drop of mercury suspended from it, and then let it be powerfully electrized, the mercury will present the phenomenon of *glow;* a current of air will rush along the rod and set off from the mercury directly downwards, and the form of the metallic drop will be slightly affected, the convexity at a small part near the middle and lower part becoming greater, whilst it diminishes all round at places little removed from this spot."—(1581.)

Fig. 74.

"Take next a drop of strong solution of muriate of lime; being electrified, a part will probably be dissipated, but a considerable portion, if the electricity be not too powerful, will remain, forming a conical drop, (fig. 74,) accompanied by a strong wind. If glow be produced the drop will be smooth on the surface. If a short low brush is formed a minute tremulous motion of the liquid will be visible."

"With a drop of water the effects were of the same kind, and were best obtained when a portion of gum water or syrup hung from a ball, (fig. 75.) When the machine was worked slowly a fine, large, quite conical drop, with concave lateral outline and a small rounded end, was produced, on which the glow appeared, whilst a steady wind issued from the point of the cone of sufficient force to depress the surface of uninsulated water held opposite to the termination. When the machine was worked more rapidly some of the water was driven off, the smaller pointed portion left was roughish on the surface, and the sound of successive brush discharges was heard. With still more electricity, more water was dispersed; that which remained was alternately elongated and contracted," and "a stronger brush discharge was heard. When water from beneath was brought towards the drop, it did not indicate the same regular, strong, contracted current of air as before; and when the distance was such that sparks passed the water beneath was *attracted* rather than driven away, and the current of air *ceased*."—(1584.)

Fig. 75.

"That the drop, when of water, or a better conductor than water, is formed into a cone principally by the current of air, is shown, amongst other ways, thus: A sharp point being held opposite the conical drop, the latter soon lost its pointed form, was retracted and became round; the current of air from it ceased, and was replaced by one from the point beneath, which, if the latter was held near enough to the drop actually blew it aside and rendered it concave in form." With still worse conductors, as oil, or oil of turpentine, the fluid was "spun out into threads and carried off, not only because the air rushing over its surface helped to sweep it away, but also because its insulating particles assumed the same changed state as the particles of air, and, not being able to discharge to them in a much greater degree than the air particles themselves could do, were carried off by the same causes which urged these in their course. A similar effect with melted sealing-wax on a metal point forms an old and well known experiment."—(1588.)

"A drop of gum water in the exhausted receiver of the air pump was not sensibly affected in its form when electrified," which was partly owing to the diminished current of air, and partly, perhaps, that the tension of the electricity on the ball is not so great in rarefied as in dense air.

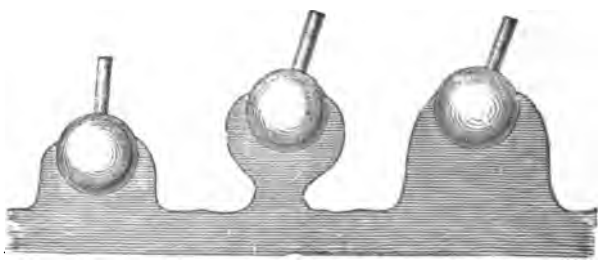
"That I many not be misunderstood," says Faraday, "I must observe here that I do not consider the cones produced as the result *only* of the current of air or other insulating dielectrics over their surface. When the drop is of badly conducting matter a part of the effect is due to the electrified state of the particles," &c.—(1594.)

"When the phenomena of currents are observed in dense insulating dielectrics they present us with extraordinary degrees of mechanical force. Thus, if a pint of well rectified and filtered oil of turpentine be put into a glass vessel and two wires be dipped into it in different places, one leading to the electrical machine and the other to the discharging train, on working the machine, the fluid will be thrown into violent motion, whilst, at the same time, it will rise 2, 3, or 4 inches up the machine wire, and dart off in jets from it into the air."—(1595.)

"A drop of mercury being suspended from an amalgamated brass ball preserved its form almost unchanged in air, but when immersed in the oil of turpentine it became very pointed and even particles of the metal could be spun out and carried off. The form of the liquid metal was just like that of syrup in air."—(1597.)

"If the mercury at the bottom of the fluid be connected with the electrical machine, whilst a rod is held in the hand terminating, in a ball three quarters of an inch in diameter, and the ball be dipped into the electrified fluid, very striking appearances ensue. When the ball is raised again so as to be at a level nearly out of the fluid, large portions of the latter will seem to cling to it, (fig. 76.) If it be raised

Fig. 76. Fig. 77. Fig. 78.



higher a column of the oil of turpentine will still connect it with that in the basin below, (fig. 77.) If the machine be excited into more powerful action this will become more bulky, and may then also be raised higher, assuming the form, (fig. 78.)

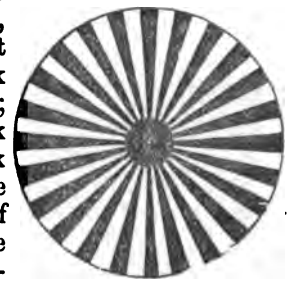
"A very remarkable effect is produced on these phenomena, connected with positive and negative charge and discharge, namely, that a ball charged positively raises a much higher and larger column of the oil of turpentine than when charged negatively."—(Faraday Researches, series XIII, 1600.)

§ 89. *Laws of the brightness of the electrical spark.*—Masson published in the 14th volume of the *Anneles de Chimie et de Physique*, page 129, (1845, 3d part,) his researches upon the brightness of the electrical spark, under the title: "*Etudes de Photometrie Electrique.*"

The ordinary photometre can be used only for permanent and not for momentary sources of light; for measuring the brightness of the electrical spark, which gives only a momentary illumination, Masson was

obliged to contrive a new photometric principle. In fact he solved the problem in a very ingenious manner.

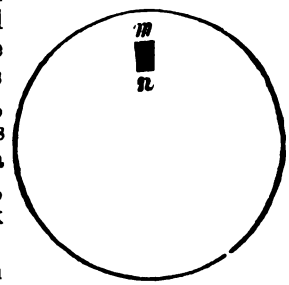
Fig. 79.



If a disk be divided into sectors equally large and alternately black and white, as in fig. 79, and be put into rapid rotation, the different sectors cannot be distinguished when the disk is illuminated by a constant source of light; but if it be illuminated by an electrical spark for an instant the sectors of the rotating disk will become visible again, and as much more so as the electrical spark is brighter. But if the illumination by the electrical spark be gradually weakened, while that from the constant source of light remain the same, a point will be attained where the sectors *just* cease to be distinguishable, and in this case the power of the illumination by the electrical spark is a determinate fraction of the illumination by the constant source, its magnitude depending upon the peculiarity of the observer's eye.

We will now consider in what manner this limit of the ability to distinguish may be ascertained.

Fig. 80.




A part of a sector on a white disk, (fig. 80,) being blackened, and the disk turned rapidly about its centre, the black piece will form a ring somewhat darker than the white ground of the disk. The ring will appear as much fainter as the black spot is narrower, and if the experiment be made with a series of such disks, each successive one having a narrower black end-portion of a sector *m n*, we will at last find one in which the dark ring ceases to be distinguishable.

Let us suppose this to be the case when the breadth of the sector is $\frac{1}{100}$ of the entire circumference; it is evident that the brightness of the ring is less than the brightness of the disk by $\frac{1}{100}$; in this case the eye cannot distinguish a difference of $\frac{1}{100}$ in illumination.

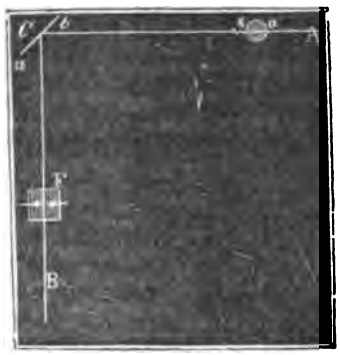
Masson made his experiments with disks upon which the breadth of the sectors were $\frac{1}{50}$, $\frac{1}{60}$, $\frac{1}{70}$, $\frac{1}{80}$, $\frac{1}{90}$, $\frac{1}{100}$, $\frac{1}{110}$, $\frac{1}{120}$, of the whole circumference, and by means of them he found that for weak eyes a difference of illumination of $\frac{1}{50}$ to $\frac{1}{70}$ was the limit of perceptibility. For ordinary eyes this limit was $\frac{1}{80}$ to $\frac{1}{100}$; for very good eyes $\frac{1}{100}$ to $\frac{1}{120}$.

On varying the intensity of the illumination Masson found that the sensibility for the same individual did not change if the illumination was sufficient for reading ordinary print.

The rotating plate being illuminated with colored light, Masson found that the limit of perceptibility of difference of illumination is independent of the color.

We now pass to the particular object of Masson's investigation. The arrangement of his experiments was essentially as follows: A rotating disk, *a b*, fig. 81, (the rotation being produced by clock-work,) divided into white and black sectors, as in fig. 79, was illuminated in the direction of *A C* by the constant light of a lamp *L*, which was movable in the line of this direction. This lamp was placed in a black case so that it could throw its light on the rotating disk only through a tube. In the direction of the line *B C* a movable spark micrometre *F* was placed. One of the knobs of this micrometer was in conducting connexion with the upper coating of a horizontal glass plate, the other knob with the lower coating; the spark always passed between the two knobs as soon as the charge of the plate had reached a certain limit, which depended upon the distance of the knobs from each other.

Fig. 81.




Masson first satisfied himself that, for the instantaneous light of the electrical spark, the intensity of the illumination was also, as in other cases, in the inverse ratio of the square of the distance.

The lamp *L* being at a given distance from the disk *a b*, the spark micrometer was gradually removed from the disk, until at the passage of the spark the sectors of the rotating disk were no longer distinguishable, and the distance of the spark from the disk was determined. The lamp was then moved, and the same experiment repeated, the distance between the knobs of the spark micrometer remaining unchanged. The following table gives the results of such an experimental series; Z denotes the distance of the lamp, Y the corresponding distance of the spark micrometer from the middle of the disk *a b*:

| Z. | Y. | $\frac{Z}{Y}$. |
|---|---|---|
| *mm.* | *mm.* | |
| 540 | 407 | 1.32 |
| 640 | 489 | 1.30 |
| 740 | 569 | 1.30 |
| 840 | 648 | 1.29 |
| 940 | 737 | 1.28 |
| 1040 | 826 | 1.25 |
| Mean..... | ..... | 1.29 |

Since Z and Y increase in an equal (or very nearly equal) ratio, it is evident that, with increasing distances, the illumination for both sources of light decreases according to the same law; hence the illumination by an electrical spark is likewise inversely proportional to the square of the distance.

The same result was given by several other series of experiments, hich Masson has arranged in tables. It will be sufficient to present ere only *one* of the many series, serving to establish each of the laws etermined.

The values of Y, as given in the tables, are always the mean of two xperiments. After the distance Y of the spark micrometer from the otating disk at which the sectors could be no longer distinguished ad been once determined the micrometer was brought considerably earer the disk again, and then removed the second time, until the ector disappeared. The two values of Y, thus determined, differed in ne various series at most by one centimetre, a proof of the exactness tainable by this method of observation.

§ 90. *Variation of the brightness of the spark at different striking istances.*— On this point Masson made numerous experiments. The llowing table contains the results of one of them:

| X. | Y. | $\frac{Y}{X}$ |
|---|---|---|
| *mm.* | *mm.* | |
| 2.5 | 318 | 127 |
| 3.5 | 447 | 127 |
| 4.5 | 572 | 127 |
| 5.5 | 697 | 126 |
| 6.5 | 830 | 127 |
| 7.5 | 957 | 127 |
| | Mean..... | 127 |

Here X denotes the striking distance, Y the corresponding distance of the spark from the rotating disk, at which the sectors cannot be listinguished, under the condition that the constant illumination of the rotating disk from AC remained unchanged during the whole eries of experiments.

It is evident, from the above table, that the striking distance and he corresponding distance of the spark from the rotating disk must vary in a constant ratio, the illumination of the disk remaining the same. Or, for double and treble striking distances, he spark must be removed two and three times as far from the disk, if its illumination by the spark is to remain the same.

By doubling the distance, the intensity of the illumination becomes four times feebler, but it remains unchanged if the striking distance is doubled, consequently the brilliancy of the spark mus tbe four times greater at double the striking distance. For the distance $n$ the illumination by the electrical spark is $n^2$ times feebler, but it remains unchanged if the striking distance is made $n$ times greater; hence, for a striking distance $n$ the brilliancy of the spark must be $n^2$ times greater, or in other words, *the brightness of the electrical spark increases as the square of the striking distance.*

§ 91. *Influence of the size and form of the surface of the condenser.*— The form of the condenser (that is, the glass plate with metallic coating on both sides, the discharge of which passes through the spark

micrometer) has no influence upon the brightness of the electrical spark if the extent of the coating remain the same. The size of the plate, however, has considerable influence.

With unchanged distance of the constant light and of the striking distance, and with the same thickness of glass, the surface of the coating was varied, and each time the corresponding distance of the spark from the rotating disk, at which the sectors just ceased to be perceived, was observed. The results of such a series of observations are given in the following table:

| Surface in square millimetres. | Ratio. | Y. | $Y^2$. | Ratio. |
|---|---|---|---|---|
| | | *mm.* | | |
| 22500 | ..... | 314 | 98596 | ..... |
| 40000 | 1.77 | 420 | 176400 | 1.78 |
| 60000 | 2.66 | 514 | 264196 | 2.67 |

The first vertical column contains the size of the surface of the coating, the second is the ratio of the first and second surfaces, and then of the first and third. The third column gives the corresponding Y, the fourth the square of this distance, and the last the ratio of the numbers of the first $Y^2$ to the second, and of the first to the third.

Comparing the second and fifth columns we have very plainly

$$\frac{F}{Y^2} = n, \tag{1}$$

that is, the superficial content F of the coating of the condenser is in proportion to the square of the distance Y, the illumination of the disk *ab* by the electrical spark remaining constant.

But the constant illumination of the disk is

$$J = c\,Y^2$$

J denoting the intensity of the light of the spark, and $c$ a constant factor, or

$$\frac{J}{Y^2} = c. \tag{2}$$

Combining equations (1) and (2) we get

$$J = \frac{c}{n}\,F;$$

or, *the brightness of the electrical spark is proportional to the surface of the coating.*

§ 92. *Relation between the intensity of the electrical spark and the thickness of the condenser.*—The surface of the coating remaining the same, the thickness of the glass plate was changed; and for each plate the distance Y was observed at which the sectors just ceased to be visible, the illumination by the lamp remaining constant. The following table contains a few of the results obtained.

| No. | Thickness of plate $d$. | Square root of thickness $\sqrt{d}$. | Y. |
|---|---|---|---|
| | *mm.* | | *mm.* |
| 1 | 1.31 | 1.14 | 1044 |
| 2 | 1.83 | 1.35 | 904 |
| 3 | 2.51 | 1.57 | 775 |

Now, $\frac{135}{114} = 1.18$ and $\frac{1044}{904} = 1.15$, that is, the two quotients are nearly equal, or $\frac{\sqrt{d''}}{\sqrt{d'}} = \frac{Y'}{Y''}$; moreover, $\frac{157}{114} = 1.27$ and $\frac{1044}{775} = 1.35$, or very nearly $\frac{\sqrt{d'''}}{\sqrt{d'}} = \frac{Y'}{Y'''}$; and, finally, $\frac{157}{135} = 1.16$, and $\frac{904}{775} = 1.17$, or $\frac{\sqrt{d'''}}{\sqrt{d''}} = \frac{Y''}{Y'''}$, therefore the values of Y are nearly in the inverse ratio of the square roots of the corresponding thicknesses of the glass; that is

$$\sqrt{d} = \frac{n}{Y}$$

or

$$d = \frac{p}{Y^2},$$

but we have $J = c\,Y^2$, hence

$$d \times J = c.\ p,$$

or

$$J = \frac{cp:}{d}$$

that is, *the intensity of the spark is inversely proportional to the thickness of the condenser.*

The remaining experiments which Masson made on this point did not coincide generally so well with the above deductions. This he ascribes to the circumstance that he could not measure the thickness of the glass with sufficient accuracy, and that the different condensers may have had unequal "capacities for condensation."

§ 93. *Influence of the nature of the pole on the electrical spark.*—Masson found that the spark is somewhat more intense, if, under circumstances otherwise the same, it be passed between lead, zinc, and tin balls, than when the balls (equal in size) are of copper, brass, or iron. Masson thinks that this depends upon the unequal tenacity of the metals. In all his experiments there were traces of a transportation of the metal from one pole to the other; now since lead, for example, is less tenacious than copper, more lead will be carried off than copper with the same tension of the electricity; the conducting circuit then will have its capacity for conduction suddenly increased, and the light must become more brilliant in consequence.

This opinion is sustained by the fact that the intensity of the spark is very considerably increased if polished brass balls be exchanged for such as have their surface amalgamated, where evidently the transference is greatly facilitated.

The spark, with the carbon used for Bunsen's battery, is very white in the middle, reddish at the edges, and looks a little like a flame.

§ 94. *Nature of electrical light.*—There are two hypotheses as to the nature of the electrical spark; the first regards it as a motion which is communicated to the ether by the electrical spark; according to the second hypothesis, electrical light is produced by incandescent ponderable matter transported by the electricity.

Masson inclines to the first hypothesis, with which also his experiments coincide, since the intensity of the spark depends in no respect upon the fusibility or oxidibility of the balls, but upon their tenacity. If, in consequence of the lower tenacity of the metals, more particles are carried off, the facility of the circuit for conduction is increased; hence the same quantity of electricity is discharged in a shorter time, whereby a more brilliant light is produced. All of the laws of the brightness of electrical light just mentioned are comprised by the following formula:

$$J = H \frac{X^2 s}{Y^2 e} \tag{1}$$

in which
J denotes the intensity of the spark;
X the striking distance;
$s$ the surface of the condenser;
Y the distance of the spark from the rotating disk of the photometer;
$e$ the thickness of the condenser, and H a constant factor depending upon elements which are not yet determined.

Substituting in equation (1), $X = p\frac{q}{s}$, which is allowable, since Riess has shown that the striking distance is proportional to the electrical density (§ 31), we have

$$J = \frac{m}{Y^2} \cdot \frac{q^2}{s^2} s \tag{2}$$

by making $\frac{Hp^2}{e} = m$, that is, equal to a constant factor which is admissible so long as the thickness $e$ of the condenser does not vary.

Hence the intensity of the electrical light is proportional to $\frac{q^2}{s^2}$ the square of the electrical density, or which is the same, to the tension of the electricity and the surface $s$ of the condenser.

Equation (1) may also be written

$$J = \frac{H}{Y^2 e} X s X$$

Substituting for the last X its value $p\frac{q}{s}$, we get

$$J = \frac{p\,H}{Y^2 e} X q. \tag{3}$$

or in words, the intensity of the spark is proportional to the striking distance and quantity of electricity.

According to equation (2),

$$J = \frac{m}{Y^2} \frac{q^2}{s},$$

or

$$J = P \frac{q^2}{s}.$$

But Riess has shown that,

$$W = Q \frac{q^2}{s},$$

is the quantity of heat which is set free in the wire by discharging through it a quantity of electricity $q$, collected on the surface $s$.

Hence *if the discharge stroke of an electrical battery produces a spark at any interruption of the circuit, the intensity of the light is proportional to the heat which the same discharge produces in a piece of wire forming part of the circuit.*

At the conclusion of his memoir, Masson proposes the spark generated under determinate conditions as the photometric unit, by which it will be possible to compare the intensity of the most diverse constant sources of light with a common standard.

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## SECTION FIFTH.

### ELECTRICAL ODOR.

§ 95. *Ozone and its reactions.*—When we are in the neighborhood of a powerful electrical machine we perceive, when the electricity issues from points, or when a series of sparks are passed from the conductor, a very peculiar odor, which, for sake of brevity, we will term *electrical odor*, or *ozone odor*. This electrical odor is very probably that which is observed after a stroke of lightning; and which, by those who do not know how to characterize it properly, is termed a sulphurous smell. Schönbein observed in the vicinity of a place where lightning had struck a decided odor of ozone, even some time after the stroke.

Until recently we were quite in the dark as to the nature of this odor. Some physicists supposed that it was owing to a peculiar affection of the organs of smell, produced by electricity; an explanation which, in addition to its error, did great injury, by preventing further investigation and discussion.

Others advanced the hypothesis that electrical odor was owing to fine metallic particles carried off by the escaping electricity. But this view also is entirely inadmissible, because the nature of the emitting points does not in the least change the nature of the odor.

Schönbein has the great credit of having restored this question to the current of scientific activity. He has shown that the electrical odor comes from a peculiar gas, produced during the electrical emission, which he calls *ozone*. He has investigated the properties of this substance for years with the greatest zeal, and although, as yet, it has not been obtained in an isolated state, many of its important chemical and physical relations have been ascertained, and further researches on the subject promise most interesting discoveries in the field of chemistry.

The first memoir of Schönbein on ozone is in the "*Denkschriften der Müncheuer Akademie.*" It is also printed in Poggendorf's Annalen. Bd. L. p. 616.

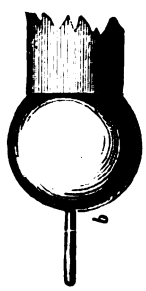
A small pamphlet with the title, "*On the production of ozone in the chemical way,*" evidently by Schönbein, was published in 1844 by Schönbein & Schweighaüser, in Basel.

The most important treatises on this subject which then followed are to be found in Poggendorfs Annalen, by reference to the index of names, appended to the LXXV volume.

In these papers the historical course of Schönbein's discoveries may be followed out. I will omit this historical investigation on account of its great extent, and I will not refer to the contents of the separate papers, but describe the most essential experiments which show the nature and most important relations of ozone, in the order in which Professor Schönbein had the goodness to show them to me in the year 1849, and, passing over their earlier phases, present his views upon its nature as now held, after many years investigation.

The prime conductor of an electrical machine being provided at the end with a round-pointed wire, *a*, *b*, about 1 line in diameter, (fig. 82.) When the machine is turned the peculiar *electrical odor* will be perceived in the vicinity of the end *a* of the wire.

Fig. 82.




That this odor is not to be ascribed to a mere subjective affection of the organ of smell, but is owing to a peculiar gas, is certain from the fact that this odorous principle produces a series of chemical and physical effects, having the greatest similarity to the chemical reactions and physical relations of other gases. Indeed, Schönbein has succeeded in preparing this odorous principle, *ozone*, in a purely chemical way, and in producing the same reactions with it which are observed when electricity is issuing from points.

If we hold before the point, at the distance of about ½ or 1 inch, a piece of paper covered with a paste of starch and iodide of potassium, the paste will at once turn blue.

To make this preparation two teaspoons full of starch with a small crystal of iodide of potassium are to be boiled to a paste, with ten times their volume of water.

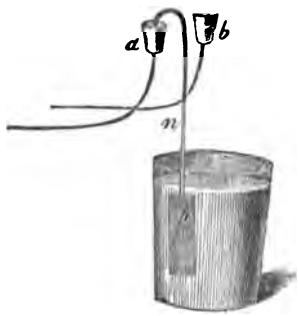
The ozone acts upon this paste as chlorine does; it decomposes the iodide of potassium, and the iodine set free, colors the starch blue.

This phenomenon (of turning the paste of iodide of potassium blue) takes place in the same manner whether the point emit positive or negative electricity; it is also perfectly immaterial of what substance the point is made, if only an emission of electricity occurs, thus refuting the view of those earlier physicists who maintained that the odor was owing to metallic particles carried off by the issuing electricity.

On holding a platinum or gold plate before the point while the machine is turned, the plate has imparted to it negative galvanic polarization, which can be demonstrated in the following manner:

Connect the two mercury cups *a* and *b*, Fig. 83, with the wire ends of a multiplier. Into the cup *a* dip a copper wire, to the other end of which a platinum plate *p* is fastened, the plate having been first soldered with gold to a platinum wire, and this to the copper wire at *n*. This platinum plate hangs in a glass vessel containing water slightly acidified.

Fig. 83.




After having exposed a perfectly similar platinum plate for a time to the electricity issuing from a point, immerse it also in the water of the glass vessel, and as soon as the copper wire of the second plate is immersed into the cup of mercury *b*, a considerable divergence of the galvanometer needle takes place, and in a direction which indicates that the platinum plate which had been exposed to ozone behaves negatively toward the other; that is, the deflection is in the same direction which would have been indicated had a zinc wire been placed in *a*, a copper wire in *b*, and these wires then immersed in the liquid of the glass vessel. This current, however, is only transient.

The whole subject of galvanic polarization we will discuss in another place;* it is only mentioned here as one of the effects which accompany the emission of electricity from points.

All these reactions disappear when sulphuretted hydrogen, ammonia, olefiant gas, &c., are diffused in the air of the room where the experiment is made.

If the emitting point be raised by the flame of a spirit lamp to a red heat, and the machine put in operation immediately after the removal of the lamp, all the above described phenomena, which had accompanied the escape of electricity, disappear; that is, the electrical odor is no longer perceived, the iodine preparation does not turn blue, platinum or gold plates are not polarized. All the phenomena reappear, however, gradually, as the point cools.

In order to make the experiment distinct, with reference to the odor, it must be made with wires of one of the precious metals, because the easily oxidable metals diffuse a peculiar smell simply by being heated. Very thin wires are not suitable for this experiment; but as thick

* See report for 1855, p. 377.

ones may not always be at hand, it will do to use a thin platinum wire having its end fused into a small knob about one line in diameter.

§ 96. *Electrical odor in the electrolysis of water.*—The electrical odor appears not only on the escape of electricity from points, but also in the electrolytic decomposition of water, where we find it accompanied by the same reaction and effects which were considered in the preceding paragraph.

On closer investigation it appears that electrical odor manifests itself at the positive pole, where oxygen is given off; for on collecting the gases resulting from the decomposition of water separately, the odor in question was perceived only in that vessel which contained the oxygen, no trace of it being found in the one containing the hydrogen.

The gases when obtained together have the electrical odor.

On suspending a paper covered with the paste of iodide of potassium in oxygen, or in the mixed gases to which the ozone odor has been imparted by electrolysis, the paper turns blue. A platinum plate exposed for a time to the action of this, gas indicates the same electro-negative polarization as though it had been acted on by the electrical brush.

Chemically pure oxygen gas produces none of these effects; it has not the odor, does not turn the iodide paste blue, and is not in the condition to polarize a platinum plate negatively.

The gas obtained by electrolytic decomposition produces, in all these cases, the same effects as the air which issues from a strongly electrified point.

§ 97. *Production of ozone in the chemical way.*—The so-called electrical odor can be produced by purely chemical means without any aid from electricity. A piece of phosphorus made perfectly dry by blotting paper, so that it has a clean surface, emits a peculiar alliaceous odor. Placing such a piece of phosphorus in a jar of air, the vapor of phosphorus will in the cold soon diffuse itself through the whole jar. A platinum plate being then suspended in the jar a short time it will be polarized *positively*.

The polarization of the platinum plate is to be ascribed to the phosphoric vapor diffused in the jar, but the odor very probably is due to the phosphoric acid, which is formed by the partial oxidation of the phosphorus vapor.

If a little water be now introduced into the jar, (as much as will half cover the piece of phosphorus,) the phosphoric odor becomes weaker and weaker, and at length wholly disappears, and in its place a decided *ozone odor* will be perceived. At rather high temperatures the ozone smell appears very soon.

This odor is not to be distinguished from that produced in the electrical way, and it is accompanied by all the reactions and effects which characterize the agency of the electrical odor. A paper with the iodide paste on it becomes blue when suspended in the jar, and a platinum plate exposed to its action is polarized *electro-negatively*.

With the ozone obtained in the chemical way the reactions can be produced almost exactly in the same form as with a point emitting electricity. For this purpose a bottle of the capacity of several quarts

is filled with air containing ozone, and closed with a cork, (Fig. 84.) having two holes bored in it. Through one of the holes a tube passes nearly to the bottom, having a funnel at its upper end; through the other hole a tube passes, which merely goes through the cork, and above the cork is bent horizontally, ending in a tolerably fine opening; water being poured through the funnel in a regulated stream, the air containing the ozone is driven out through the point of the other tube. This point now behaves exactly like a metallic point from which an electrical brush issues. By holding the nose to it the *electrical odor* will be observed; the iodide paper held before it turns *blue*, and a platinum plate exposed to the jet is polarized *electro-negatively*.

Fig. 84.

We have seen above that all the effects of ozone disappear when the point emitting the brush is heated, in like manner all the reactions of ozone disappear as soon as the horizontal part of the escape tube is strongly heated by a spirit lamp. The air which escapes from the opening of the hot tube has no longer any smell, it will not turn the iodide paper blue, nor polarize the platinum plate. But all these effects reappear on the cooling of the tube.

§ 98. *Chemical nature of ozone.*—Schönbein, the discoverer of ozone, has observed and investigated for years, with unwearied industry, the relations of this remarkable substance, and has found that it bears the greatest resemblance to the hyper oxides; he has finally come to the opinion that ozone is nothing else than a *gaseous peroxide of hydrogen.**

Ozone is therefore formed by a further oxidation of the vapor of water contained in the air. Thus it is explained why water, or rather the vapor of water, is absolutely necessary to the formation of ozone. In perfectly dry air ozone cannot be obtained by means of phosphorus.

Electricity prepares the vapor of the atmosphere to oxidize further

* At the present time, however, the view of nearly all of the chemists who have studied this subject is different from that given by the author. It is now generally conceded that ozone is nothing but oxygen, but there are two different views in regard to its nature; according to one, ozone is simply oxygen thrown into a condition of *activity* by the instrumentality of electricity or other agents above named.

The other view considers ozone as formed of two or more equivalents of oxygen. If, as some hold, gaseous oxygen be $o_2$, it could be easily shown that this double molecule undergoing decomposition, (even by reducing agents as phosphorus, the essential oils, &c.,) sets free $o_1$, (oxygen in the *nascent state*,) which might unite with $o_2$ to form $O\ o_2$, similar in properties to $S\ o_2$, (sulphurous acid,) sulphur and oxygen being elements capable of replacing each other to form analogous compounds as in the sulphurets and oxides.

We deem it moreover quite possible, in a measure, to reconcile the views of Schönbein with those last named, but this whole subject, being a purely chemical question, would be out of place in a report upon physical science, and has only been mentioned because the bare statement in the text might lead those not familiar with the matter into erroneous views. G. C. S.

and form ozone; in like manner phosphorus effects the combination of the vapor of water with oxygen, but, as yet, we are not able to tell *how* it is done.

Ozone is decomposed into its components, oxygen and hydrogen, by heat, as shown by the experiment noticed above.

De la Rive and Berzelius, indeed, regarded ozone as modified oxygen, and maintained that it could be produced by an electrical jet in dry oxygen, but this is contrary to all Schönbein's analogies. Schönbein presented the following experiment as the most striking proof of the presence of hydrogen in ozone: if air containing ozone be dried as perfectly as possible and then heated, it yields water on cooling to hydroscopic bodies over which it is passed. The ozone is decomposed by heat, and the vapor of water which it contained is set free.

Ozone is one of the most powerful means of producing oxidation which is known. Air containing ozone being passed for a long time over finely divided metallic silver, the latter is converted into *peroxide of silver*. The vapor of phosphorus is rapidly oxidized under the influence of ozone, and converted into phosphorous acid and phosphoric acid.

The fact that the passage of the electrical spark through moist atmospheric air forms nitric acid was discovered by Cavendish, in the year 1785. Schönbein has proved that under like circumstances ozone also is always formed.

Since ozone can be produced in moist oxygen by the help of the electric spark, it is evident that the formation of ozone is independent of that of nitric acid. On the contrary, Schönbein has made it appear highly probable that the formation of nitric acid is not a direct effect of electricity, but a secondary effect produced by the oxidizing influence of ozone on the nitrogen of the atmosphere.

The formation of nitric acid by electricity may be shown in the simplest manner, by exposing, for a time, a paper moistened with a solution of carbonate of potash to a jet of electricity escaping from a wire; the carbonate, under these circumstances, is converted in part into nitrate of potash.

The ozone formed by means of phosphorus also produces nitric acid. The mixture of phosphorous and phosphoric acids, which forms in a receiver containing a piece of phosphorus, water, and atmospheric air, is absorbed by water. If this water be colored by a solution of indigo, the color of the latter is immediately destroyed, an effect which neither phosphorous nor phosphoric acid alone can produce. The decoloring is effected by a small quantity of nitric acid, which, formed under the influence of the ozone, is also dissolved in the water.

That it is actually nitric acid which is here in question is proved by shaking the water with milk of lime; insoluble salts of lime are formed with the phosphorous and phosphoric acids, while a nitrate of lime remains in solution.

Davy observed that traces of nitric acid appeared at the positive pole of a pile when a voltaic current passed through water containing air or nitrogen. Here, also, the formation of nitric acid is a secondary effect

of electricity. Ozone is first formed by the action of the current, and the ozone then oxidizes the nitrogen.

§ 99. *Illumination of phosphorus produced by ozone.*—It is well known that at low temperatures, slow combustion of phosphorus does not take place in air free from ozone, and there is therefore no illumination in the dark; this, however, appears as soon as ozone is brought into contact with the phosphorus. In a receiver containing ozonized air phosphorus shines at a very low temperature.

Schönbein has shown this very beautifully by presenting a stick of phosphorus, at a low temperature, to an electrical brush, which, in accordance with the above, determines the formation of ozone. The manner in which the experiment was made is as follows: (Pog. Ann., lxviii, 38.)

A piece of phosphorus an inch long, having a clear surface, was placed on a board in conducting connexion with the earth, and the free end of a wire, connected with the conductor of an electrical machine, brought within a few lines of the phosphorus. At a temperature of —2° the phosphorus by itself did not shine in the dark; but when the machine was put in motion, so that an electrical brush played against the piece of phosphorus, a light flame at once issued from its whole length, and, like the tail of a comet, extended far beyond the piece of phosphorus. If the machine be stopped the illumination of the phosphorus ceases in a few seconds.

Schönbein obtained a very beautiful illumination by the following arrangement: A copper wire was coiled around a stick of phosphorus an inch long, so that the end of the wire extended about a line beyond the phosphorus, as shown in fig. 85. The other end of the wire is connected with the conductor of an electrical machine. At a temperature below 0° the phosphorus did not shine at all in the greatest darkness; but in turning the electrical machine, so that a strong brush appeared at the end of the coil, a luminous cone protruded from the middle of the brush, which attained a length varying from a few inches to some feet, according to circumstances. The longest cone obtained by Schönbein was 2½ feet. With powerful machines such cones should be obtained of still greater length.

Fig. 85.

It may be assumed without hesitation that this luminous train is nothing else than the vapor of phosphorus in slow combustion.

The luminous train vanishes with the electrical brush.

# GALVANISM.

[Continued from page 423 of the Report of 1855.]

## SECTION FOURTH.

### GALVANIC PHENOMENA OF LIGHT AND HEAT.

§ 54. *Production of heat by the galvanic current*—The laws of the development of heat produced by the galvanic current in metallic wires, have been investigated by Joule, (Phil. Magazine, Oct., 1841,) and by Lenz, (P. A. LIX, pp. 203 & 407, LXI, p. 18.)

The memoir of Joule not being within my reach, I shall only report on the researches of Lenz, and this will be sufficient, since the results of the Russian and of the English physicist agreee.

The first two sections of the memoir of Lenz, in vol. LIX of Pog. Ann., contain only introductory matter, to which we shall but briefly refer.

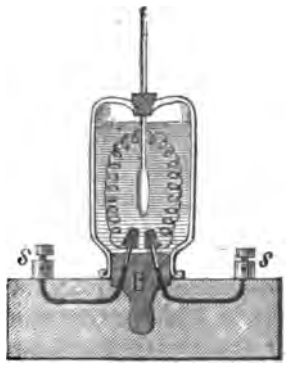
To measure the strength of the current Lenz made use of a Nervander's tangent compass, which was most carefully constructed and tested. He found by accurate experiments that up to 40° the strengths of the currents are proportional to the tangents of the angles of deflection.

Lenz also compared his tangent compass with the decomposition of water. It results, from his numerous and accurate experiments, that the tangent of the observed angle of deflection is to be multiplied by 39.3 in order to obtain the reduced quantity of detonating gas from the same current per minute, expressed in cubic-centimetres. Lenz takes for his unit a current which causes a deflection in his tangent compass of 1°, and this produces 0.686 c. c. of the mixed gases in a minute. Since our unit of current is that which gives 1 c. c. per minute, it is evident that Lenz's values of strength of current must be multiplied by 0.686 to reduce them to our unit. In what follows I shall always make use of the reduced values for the strength of current, instead of those of Lenz.

As the unit of resistance Lenz takes the resistance of one wind of his rheostat (agometre) of German silver, which, according to his statement, is equal to the resistanee of a copper wire of 6.358 English feet in length, and 0.0336 English inch in diameter. Hence, it appears that this unit of resistance is equal to 2.66 of our own; the values of Lenz must therefore be multiplied by 2.66 to reduce them to our unit.

To measure the heat produced by the galvanic current in a metallic wire, Lenz used the apparatus represented in Fig. 47.

Fig. 47.




In the middle of the board is fastened the glass stopper B, ground to fit into the neck of a glass jar which, by means of some grease, may be fitted upon it air and water-tight. A brass clamp, omitted in the figure, presses the lower rim of the neck of the jar to the board, so that it cannot be displaced even by violent motions of the apparatus. The jar has ground in its bottom a cylindrical hole, into which the fluid can be poured, and through which, also, a thermometer can be inserted by means of a cork. The thermometer used was divided to $\frac{1}{5}$ of a degree. Two pieces of wire of about 1 line in diameter are passed through perforations in the glass stopper and cemented there. Their upper extremities projecting into the jar are somewhat conical, and made of platinum; these platinum cones are soldered to copper wires of equal diameter, which, let into the board, pass to the screw-clamps *s*, into which the conducting wires from the poles of the battery are screwed. The wire to be heated is previously coiled into a spiral around a cylinder of 1—2 lines in diameter, and has its ends clamped upon the cones by means of two little pieces of platinum. It remains erect by its own elasticity, its coils not touching anywhere.

The fluid with which the jar was filled, so far at least as entirely to cover the wire-spiral, was spirit of wine containing 85 to 86 per cent. of alcohol, for water is so good a conductor that a part of the current would pass through it and not through the wire, as becomes immediately apparent from the feeble evolution of gas.

After the wire-spiral was properly fastened and a measured quantity of spirit of wine poured into the jar the apparatus, together with the multiplier (Nervander's tangent compass) and the rheostat, were inserted in the circuit of a Daniell's battery. By means of the rheostat the current was always kept at a constant strength; and then the time required to raise the thermometer in the spirit of wine a certain number of degrees was noted. By turning round the apparatus in a small circle, the fluid was made to rotate, whereby an equal distribution of the temperature throughout its mass was produced.

In order to avoid the errors arising from the loss of heat to surrounding bodies, the spirit of wine was previously cooled below the temperature of the air, and the experiment finished when its temperature was just as many degrees above that of the surrounding air as it had been below it at the commencement.

To give a clear idea of the course of the investigation, the individual steps for one series of experiments will be described at length.

The temperature of the air being 16° R, the spirit of wine was cooled by means of ice down to 7° and poured into the jar; the circuit was closed and the needle by means of the rheostat constantly kept at 35°; next, with a watch marking seconds, the exact instant was observed when the temperature of the spirit was 10, 11, 12, 13, 14, and

15 degrees, and also the instant when it was 16, 17, 18, &c., to 22 degrees. In this way it was found that the time required to raise the temperature of the spirit of wine from—

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | to 17 | viz: | 2° | was | 1.05 | minutes. |
| 14 | " 18 | " | 4 | " | 2.22 | " |
| 13 | " 19 | " | 6 | " | 3.25 | " |
| 12 | " 20 | " | 8 | " | 4.30 | " |
| 11 | " 21 | " | 10 | " | 5.42 | " |
| 10 | " 22 | " | 12 | " | 6.53 | " |

and hence it follows that the time $t$, necessary to raise the temperature of the spirit of wine 1°, was on an average 0.542 minutes.

The resistance to conduction of the spiral wire was ascertained by observing, (after the removal of the apparatus of fig. 47 from the circuit,) how many turns of the rheostat had to be inserted, in order to bring the current again to the same strength that it had with the heating apparatus in the circuit.

The following table contains the results of a great number of such experiments:

| No. of set of experiments. | Kind of wire. | $s$. | $t$. | $l$. |
|---|---|---|---|---|
| 1. | German silver, $a$ | 6.93 | 1.349 | 93.50 |
| 2. | do | 10.53 | 0.571 | 93.63 |
| 3. | do | 14.30 | 0.300 | 93.94 |
| 4. | German silver, $b$ | 10.53 | 0.920 | 58.76 |
| 5. | do | 14.30 | 0.481 | 58.64 |
| 6. | do | 18.32 | 0.288 | 59.01 |
| 7. | do | 14.30 | 0.457 | 60.16 |
| 8. | German silver, $c$ | 18.32 | 0.384 | 44.59 |
| 9. | Platinum | 14.30 | 0.555 | 50.45 |
| 10. | do | 18.32 | 0.325 | 51.41 |
| 11. | Iron | 22.69 | 0.435 | 24.92 |
| 12. | Copper | 18.32 | 1.301 | 13.90 |
| 13. | do | 22.69 | 0.835 | 13.90 |
| 14. | do | 27.52 | 0.575 | 13.92 |
| 15. | do | 32.98 | 0.381 | 14.01 |
| 16. | do | 27.52 | 0.544 | 14.31 |

Three different wires of German silver were used in the experiments; that designated by $a$ was the thinnest; $b$ was a little thicker than $a$ and $c$ a little thicker than $b$.

In this table $s$ denotes the force of the current; $l$ the resistance to conduction of the wire, expressed in units; and $t$ is the time necessary to raise the temperature of the spirit of wine 1°. How the value of $t$ was determined each time from a series of experiments has already been stated above.

The quantity of spirit of wine poured into the jar was always nearly the same, or 90 grammes on an average.

If we compare all those series of experiments in which the force of

the current was the same, it appears that the product of $t$ and $l$ remains pretty nearly constant. It is—

For the current 10.53:

(2.) German silver, $a$ ..... $t\,l = 53.46$
(4.) German silver, $b$ ..... $t\,l = 54.06$

For the current 14.30:

(3.) German silver, $a$ ..... $t\,l = 28.18$
(5.) German silver, $b$ ..... $t\,l = 28.11$
(7.) German silver, $b$ ..... $t\,l = 27.49$
(9.) Platinum ..... $t\,l = 28.00$

For the current 18.32:

(6.) German silver, $b$ ..... $t\,l = 16.99$
(8.) German silver, $c$ ..... $t\,l = 17.12$
(10.) Platinum ..... $t\,l = 16.71$
(12.) Copper ..... $t\,l = 18.08$

For the current 22.69:

(11.) Iron ..... $t\,l = 10.84$
(13.) Copper ..... $t\,l = 11.60$

The equality of the values of $t\,l$ for one and the same current is so apparent that we may safely assume that the time of heating is inversely proportional to the resistance to conduction, or in other words, that the heat produced in a given time is directly proportional to the resistance to conduction, and independent upon other properties of the metal.

In order to find out how the production of heat depends on the force of the current, we must compare the experiments that were made with the same wire, and with different currents; from these it appears that the value of $s^2t$ is nearly constant for the same wire. The results are as follows:

For the German silver wire $a$:

1 ..... $s^2t = 64.8$
2 ..... $s^2t = 63.3$
3 ..... $s^2t = 61.3$

For the German silver wire $b$:

4 ..... $s^2t = 102.0$
5 ..... $s^2t = 98.4$
6 ..... $s^2t = 96.7$
7 ..... $s^2t = 93.5$

For the platinum wire:

9 ..... $s^2t = 113.5$
10 ..... $s^2t = 109.1$

For the copper wire:

12 ..... $s^2t = 436.6$
13 ..... $s^2t = 429.9$
14 ..... $s^2t = 435.5$
15 ..... $s^2t = 414.2$
16 ..... $s^2t = 412.0$

By these experiments, therefore, it is demonstrated that:

1. *The production of heat is proportional to the resistance of the wires to conduction.*

2. *The production of heat is proportional to the squares of the forces of the currents.*

If, therefore, $t$ denotes the time which is required for the current $s$ with the resistance to conduction $l$, to raise the temperature of a given quantity of spirit of wine 1° R. then $s^2tl$ will be the time necessary to produce the same amount of heat in the same quantity of spirit, by the unit of the strength of current with the unit of resistance to conduction. Since now in all the experiments the quantity of spirit of wine was nearly the same, the product $s^2tl$ must also be nearly the same for all of the series in the above table. The product $s^2tl$ has the following values for the different series of experiments:

| *Series.* | $s^2tl$. |
|---|---|
| 1 | 6059 |
| 2 | 5927 |
| 3 | 5758 |
| 4 | 5994 |
| 5 | 5770 |
| 6 | 5706 |
| 7 | 5625 |
| 8 | 5747 |
| 9 | 5726 |
| 10 | 5609 |
| 11 | 5975 |
| 12 | 6069 |
| 13 | 5976 |
| 14 | 6062 |
| 15 | 5803 |
| 16 | 5896 |
| Mean | 5856 |

The quantity of spirit heated in these experiments together with that of the glass, reduced by the relation of the specific heats to spirit, was 118 grammes.

The unit of the force of current produces, therefore, when passing through a wire which offers the unit of resistance to conduction, as much heat as would be required to raise the temperature of 118 grammes of spirit of wine 1° R. in 5856 minutes.

The specific heat of the spirit used in the above experiments is 0.7; to raise, therefore, the temperature of 118 grammes of spirit to a given degree requires the same quantity of heat as to raise 118.07 = 82.6 grammes of water to the same degree. For 1 gramme of water, therefore, that time amounts to:

$$\frac{5856}{82.6} = 70.9 \text{ minutes;}$$

or if instead of Reaumer's scale that of Celsius is employed, 70,9 . 0,8 = 56.72 minutes,* *i. e.*, when the unit of the force of current passes through a wire, the resistance of which is equal to that of a copper wire of 1 meter in length and $1^{mm}$ in diameter, the quantity of heat produced is such as would raise the temperature of 1 gramme of water 1° C. in $56\frac{3}{4}$ minutes.

* In the memoir of Lenz, an error occurs in this calculation, (Pog. Ann., LXI, 42,) occasioned probably by mistaking minutes for seconds.

If we take for the unit of heat, as is usually done, that quantity which raises the temperature of one kilogramme of water 1°, then it follows from the above investigations that the unit of the force of current, in passing through the unit of resistance produces in it 0.001057 units of heat in one hour and 0.0000176 in one minute.

§ 55. *Observations on the results obtained by Lenz.*—After Lenz had determined the relation between the force of current and the production of heat in a metallic circuit, the idea naturally occurs that we might compare the heat produced in the circuit wire with the quantity of detonating gas produced by decomposition of water in the exciting cells, but a more intimate study of the subject soon proves that such a comparison cannot lead to a constant result.

If there be a fixed relation between the quantity of detonating gas and the production of heat for any given arrangement of the Voltaic battery and a given closing wire, it will be changed as soon as—*cæteris paribus*—either the specific resistance to conduction of the battery or its electromotive force is changed; for by either of these changes the strength of current is altered, and the evolution of gas changes proportionally with the force of current, while the production of heat increases as the squares of this force; and the relation between the quantity of gas and the heat developed must necessarily become different from what it was before. The heat produced in the closing circuit, therefore, can by no means be considered as a thermal equivalent of the detonating gas evolved in the exciting cells, and consequently there can be no definite relation between the heat produced by exploding a certain quantity of detonating gas, and that set free in the closing circuit during the evolution of an equal quantity of gas in the exciting cells of a galvanic battery.

The attempt to compare, even with only approximate correctness, the quantity of electricity of the electrical machine with that of Volta's apparatus, has always, hitherto, been unsuccessful. After Lenz's accurate researches on the production of heat by the galvanic current, and Riess' reliable quantitative determinations of the heat set free in a wire by the passage of the discharge of a Leyden jar, at first sight it would seem that a basis was found for this comparison. But here too the result on examination is a negative one.

From the rather large quantity of heat produced in metallic wires by the discharge of the jar, we should be disposed to infer that a rather large quantity of electricity was brought into action thereby; according to the experiments before mentioned* the increase of heat in the platinum wire of the air thermometer for $\frac{q^2}{s} = 1$ is equal to 0.3787, or in round numbers equal to 0.4. That wire had a diameter of 0.072‴ and a length of 59.7‴ and therefore it weighed about 60 milligrammes; to raise the temperature of this wire 0.4° requires, as can easily be computed, 0.000000768 units of heat.

Let us now consider what quantity of heat would have been set free in the same platinum wire by the unit of galvanic current. In the

* See Report of 1856, p. 437.

unit of resistance, the unit of current produces 0.0000176 units of heat per minute; but the resistance to conduction of such a platinum wire, as can easily be calculated, is equal to 6 and consequently by the unit of current, $0.0000176 \times 6 = 0.0001$ units of heat would have been produced in it. The increase of temperature in the platinum wire from the discharge of the jar for $\frac{q^2}{s} = 1$, viz: 0.000000768 is therefore nearly $\frac{1}{100}$ of that produced by the unit of force of the current during one minute in the same wire. When $s = 1$, *i. e.* when the electricity is accumulated in *one* of the jars (mentioned in the experiment above quoted,) $q$ must also be equal to 1. For $s = 1$ and $q = 10$, *i. e.* when the jar is charged with 10 sparks from the measuring jar under the circumstances formerly explained, then its discharge must produce in a metallic wire an increase of heat nearly equal to that produced by the unit of current during one minute in the same wire. But to charge the jar with $q = 10$, the machine will scarcely require to be turned for one minute, and therefore the inference might be drawn from a superficial investigation of the production of heat, that turning the machine for one minute would produce a quantity of electricity equal to the chemical unit of the galvanic current.

But that such a comparison, or rather such a conclusion from the comparison can not at all be admitted, is evident from the fact, that by means of the electrical machine no perceptible decomposition of water can be obtained, while one cubic centimetre of detonating gas ought to be readily evolved per minute.

But a more careful investigation soon shows that the discharge of the jar and the galvanic current act under entirely different and not comparable conditions, in producing heat in the wire.

The same charge of the jar when passing more slowly through a wire produces less heat in it, and the increase of temperature becomes imperceptible as soon as the time of discharge reaches a measurable duration; if, therefore, the quantity of electricity, obtained by turning the machine for one minute, when accumulated in the jar produces by its discharge perceptible heat, the same quantity of electricity discharged through the wire in a continuous current during one minute, will not perceptibly raise the temperature of the wire. But only such a current can be compared with the galvanic. In order to compare the electricity of the machine with that of the battery in relation to quantity, we should be able to measure the quantity of heat which is produced in a metallic wire by the electricity passing through it from the conductor of the machine. The instantaneous discharge of an accumulated quantity of electricity cannot directly be compared with a continuous current. That the process by which heat is evolved in the discharge of the Leyden jar is entirely different from that of the galvanic current, is also evident from the fact, that with the former not only the quantity of electricity discharged through them is concerned, but also the area of surface upon which it was previously distributed; thus, in the production of heat by the discharge of the jar, factors come into question which with the current do not appear at all. The galvanic current and the discharge of the jar have, as far as regards the production of heat in metallic wires only this in com-

mon, that the rise of temperature is proportional to the square of the quantity of electricity and to the resistance of the conducting wire.

§ 56. *Ignition of metallic wires by the galvanic current.*—While the phenomena of the ignition of metallic wires by means of the discharge of the Leyden jar have been elucidated by the ingenious researches of Riess, corresponding investigations are wanting in reference to the galvanic current, though the latter might probably offer less difficulties than the former.

In Casselmann's treatise (already mentioned) "On the galvanic carbon-zinc battery, Marburg, 1844," the following remark occurs on page 43:

"A platinum wire of considerable length used for closing the circuit, does not become red hot, but when shortened to a certain length it does. Lessening this, however, by shortening it more and more it reaches finally a length at which it does not become red hot any more, and from this it follows that the ignition of the closing wire reaches a maximum only when its resistance to conduction bears a certain proportion to the quantity of electricity forcing its way through it."

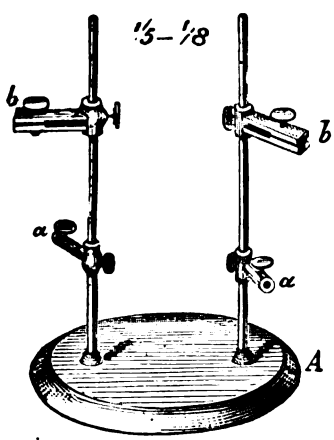
If the current of a battery makes a wire red hot by passing through it, still the force of this current must increase by shortening the wire, and it therefore appears not quite probable that the stronger current should no longer heat the shorter piece of wire to redness. To throw some light on this point, I made a series of experiments myself, since, as above remarked, no thorough investigations have been made on this law of ignition in the galvanic current.

My experiments were made in the following manner: In the circuit of the battery *S* (fig. 48) there was inserted at *H*, a wire-holder, which will next be described, and at *B*, a tangent compass. At *Q* there was a little mercury cup, by means of which the circuit could readily be opened and closed.

The wire-holder is represented in fig. 49. Upon a board two brass rods were fastened, on each of which were two screw clamps capable of sliding up and down.

Fig. 48.

Fig. 49.



In one of the clamps *a*, the connecting wire from one pole of the battery was screwed and in the other that leading to the tangent-compass. Between the clamps *b*, the experimental wires were extended and this was always done before closing the battery. The connecting wires between *S*, *H*, *B*, *Q* and *S*, were copper wires about ¼ line in diameter, and of a total length not exceeding 5 metres, so that their resistance was not considerable.

After the wire to be experimented upon was properly inserted at *H* and all the other connexions properly made, the circuit was closed at *Q*; and, after the compass needle had come to rest, its deflection was observed and at the same time the appearance of the ignition in the wire.

The course of the experiments will become evident from the following tables which contain the results of the observations.

The first three sets of experiments were made with platinum wire of 0.45 millimetres in diameter.

FIRST SERIES.

*Battery of* 40 *carbon-zinc cups.*

| Length of wire. | Deflection of compass needle. | Appearance of ignition. |
|---|---|---|
| *Metres.* | ° | |
| 1.5 | 45 | |
| 1.3 | 46 | Feeble, only in some spots. |
| 1.1 | 47 | Feeble throughout the whole length. |
| 1.0 | 48 | Red hot. |
| 0.8 | 50 | Bright red. |
| 0.5 | 56 | Nearly white hot. |

SECOND SERIES.

*Battery of* 24 *carbon-zinc cups.*

| | | |
|---|---|---|
| 0.6 | 44 | |
| 0.5 | 45 | Feeble, only in some spots. |
| 0.4 | 46 | Somewhat increased. |
| 0.3 | 48 | Red hot throughout the whole length. |
| 0.1 | 51 | Bright red. |

THIRD SERIES.

*Battery of* 12 *carbon-zinc cups.*

| | | |
|---|---|---|
| 0.3 | 46 | Feeble, nearly throughout the whole length. |
| 0.3 | 47 | Still feeble throughout. |
| 0.2 | 48 | Red hot. |
| 0.1 | 50 | Bright red. |

Two series of experiments with an iron wire of 0.42 millimetre in diameter gave the following results:

FOURTH SERIES.

*Battery of* 24 *carbon-zinc cups.*

| Length of wire. | Deflection of compass needle. | Appearance of ignition. |
|---|---|---|
| *Metres.* | ° | |
| 1 | 32 | In some places. |
| 0.8 | 33 | Not quite throughout the entire length. |
| 0.6 | 34 | Red hot. |
| 0.4 | 35 | Bright red. |
| 0.3 | ---------- | Melted. |

FIFTH SERIES.

*Battery of* 12 *carbon-zinc cups.*

| | | |
|---|---|---|
| 0.5 | 32 | In some places. |
| 0.4 | 33 | Somewhat increased. |
| 0.2 | 35 | Intensely red hot. |
| 0.1 | ---------- | Melted. |

In reference to the experiments with iron wire it is to be remarked that in each one a new piece was inserted, because by ignition the surface was oxydized, and consequently the wire was altered.

These experiments prove *that one and the same wire produces, with the same strength of current, the same phenomena of ignition, whatever may be its length.*

In the platinum wire of 0.45 metre in diameter a partial ignition is produced by a strength of current corresponding to a deflection of 45° to 46°. With 40 elements this is effected in a wire of 1.3 metre in length, with 24 cups in one of 0.5 metre, and with 12 cups in one of 0.4 metre.

The red heat appears in all these experiments with a force of current of 48°, while in the first series the length of wire is 1 metre, in the second 0.3 metre, and in the third 0.2 metre.

The light red heat occurs with a strength of current of 50 to 51°.

Quite similar are the results from the experiments with the iron wire. Partial ignition appears with a force of current of 32° to 33°, intense red heat with 35°. These experiments therefore do not show the peculiarity mentioned by Casselmann. It is to be regretted that he gives no more exact details, from which perhaps the reason of the anomaly observed by him could be explained. I presume, however, that it is caused by the great conduction of heat by the mass of the metal in the wire clamps, which has a considerable influence with very short wires.

Casselmann used a wire-holder similar to that represented in fig. 49. By observing attentively a wire held by it while it is red hot, we perceive that in the immediate vicinity of the clamps its glow is considerably less than in the middle. If now the wire be so far shortened that the cooling influence of the clamps extends to its middle it seems easy to explain how, by shortening the length of the wire, the phenomena of ignition finally disappear. This is also seen from the following observation:

A platinum wire 0.21 metre in diameter was inserted in the circuit of a single carbon-zinc cup. With a length of 3 centimetres it became feebly red hot, while the tangent compass indicated 26°; but when the same wire was shortened to 1 centimetre no ignition was produced, even with a current of 34°.

When, instead of the single element, two Bunsen's cups were used, the appearances of ignition were entirely identical with the lengths of both 3 and 1 centimetre, though the corresponding deflection in the former case was 34°, and in the latter (the shorter wire) 44°.

§ 57. *Relation between the diameter and force of current in metallic wires ignited by the galvanic current.*—The above experiments do not illustrate the relation between the force of current and the diameter of the wires, as corresponding to a certain degree of ignition, because only the length, but not the diameter of the wire, was varied.

The following table gives the results of a set of experiments made with platinum wires of 1 decimetre in length and variable diameters:

| Diameter, D. | Degree of ignition. | Deflection, $v$. | Force of current, $s = 70$, tang. $v$. | $\frac{s}{D}$ |
|---|---|---|---|---|
| *mm.* | | ° | | |
| 0.3 | Feeble | 34 | 47.18 | 163.9 |
| | Red hot | 36 | 50.82 | 169.4 |
| | Bright red | 38 | 54.67 | 182.2 |
| | Very bright red | 42 | 63.00 | 210.0 |
| 0.39 | Feeble | 43 | 65.24 | 163.7 |
| | Red hot | 46 | 72.45 | 185.5 |
| | Bright red | 48 | 77.77 | 199.5 |
| 0.45* | Feeble | 47 | 75.06 | 166.6 |
| | Red hot | 48 | 77.77 | 172.2 |
| | Bright red | 50.3 | 84.42 | 187.6 |
| | Nearly white hot | 56 | 103.74 | 230.3 |
| 0.75 | Red hot | 60 | 121.24 | 161.7 |
| | Bright red | 66 | 157.22 | 209.3 |

The experiments marked * are taken from the former series, (on page 420.)

From this series of experiments we may assume that, *in order to produce the same degree of ignition, the force of current must increase proportionally to the diameter of the wires.* According to this law, for

the same degree of ignition the quotient of the diameter of the wire into the corresponding force of current should be a constant quantity. The last column of the previous table contains this quotient. It is:

For feeble ignition—

| With the diameter. | | Deviation from the mean. |
|---|---|---|
| 0.3 | 163.9 | — 0.8 |
| 0.39 | 163.7 | — 1.0 |
| 0.45 | 166.6 | + 1.9 |
| Mean..... | 164.7 | |

For red heat—

| | | |
|---|---|---|
| 0.3 | 169.4 | — 2.8 |
| 0.39 | 185.5 | + 13.3 |
| 0.45 | 172.2 | 0 |
| 0.75 | 161.7 | — 10.5 |
| Mean..... | 172.2 | |

For bright red heat—

| | | |
|---|---|---|
| 0.3 | 182.2 | — 12.4 |
| 0.39 | 199.5 | + 4.9 |
| 0.45 | 187.6 | — 7.0 |
| 0.75 | 209.3 | + 14.7 |
| Mean..... | 194.6 | |

For very bright red, nearly white heat—

| | | |
|---|---|---|
| 0.3 | 210.0 | — 10 |
| 0.45 | 230.0 | + 10 |
| Mean..... | 220.0 | |

The deviations from the mean are so irregularly distributed, in respect to their quantity as well as to their sign, that without hesitation we may attribute them to errors of observation. That these deviations are so considerable, varying up to 7 per cent. of the corresponding quotients, will not surprise us if we consider that the degrees of ignition are not measured, but only *estimated*.

A set of experiments similar to the above, with iron wire, gave the following results:

| Diameter. D | Degree of ignition, | Deflection. $v$. | Force of current. $s = 70$, tang. $v$. | $\frac{s}{D}$. |
|---|---|---|---|---|
| 0.2 | Feeble. | 19° | 24.08 | 120.4 |
| " | Red. | 20 | 25.41 | 127.0 |
| 0.255 | Feeble. | 24 | 31.15 | 122.1 |
| " | Red. | 25 | 32.62 | 127 9 |
| 0.38 | Feeble. | 34 | 47.18 | 124.1 |
| " | Red. | 38 | 55.67 | 146.1 |
| 0.75 | Feeble. | 52 | 89.6 | 119.4 |
| " | Red. | 56 | 103.74 | 131.3 |

The quotient $\frac{s}{D}$ is therefore:

For feeble ignition—

| With the diameter. | | Deviation from the mean. |
|---|---|---|
| 0.2 | 120.4 | — 1.1 |
| 0.255 | 122.1 | + 0.6 |
| 0.38 | 124.1 | + 2.6 |
| 0.75 | 119.4 | — 2.1 |
| Mean..... | 121.5 | |

For red heat—

| | | |
|---|---|---|
| 0.2 | 127.0 | — 7.8 |
| 0.255 | 127.9 | — 6.9 |
| 0.38 | 146.1 | + 11.3 |
| 0.75 | 138.3 | + 3.5 |
| Mean..... | 134.8 | |

This series therefore confirms the results we obtained from the experiments with the platinum wire.

With *copper* wire the following results were obtained:

| Diameter. | Degree of ignition. | Deflection. | Force of current. | $\frac{s}{D}$. |
|---|---|---|---|---|
| D. | | $v$. | $s = 70.$ tang. $v$. | |
| 0.2 | Feeble. | 48° | 77.77 | 388.8 |
| " | Red. | 52 | 89.60 | 448.0 |
| 0.255 | Red. | 59 | 116.48 | 418.3 |
| With *silver* wire: | | | | |
| 0.2 | Red.* | 51 | 86.45 | 432.2 |
| 0.255 | Feeble. | 57 | 107.80 | 422.7 |

§ 58. *Comparison of the laws of galvanic ignition with those of Lenz for the development of heat.*—According to the laws of Lenz, the quantity of heat liberated in a metallic wire increases proportionally to the square of the force of the current, and to the resistance to conduction of the wire. But with equal length the resistance to conduction is inversely proportional to the square of the diameter. If, therefore—all the other conditions remaining unchanged—the force of current increases as the diameter of the wire, the quantity of heat developed must remain the same.

But if in a thicker wire just as much heat is evolved as in a thinner one, we should certainly expect that the former would not attain the same degree of ignition as the latter, because the thicker wire imparts more heat to the surrounding air; therefore, in order to obtain an equal degree of ignition in a wire of $n$ times the diameter, we should have to employ a current more than $n$ times stronger, while according to the above experiments a current with $n$ times increased force is sufficient.

Let us more accurately determine this relation. According to the researches of Lenz, above discussed, the heat produced in metallic

* Melted after a while.

wires by a galvanic current is proportional to the square of the force of current and to the resistance to conduction of the wire. We can, therefore, put

$$W = s^2 l \quad . \; . \; . \; . \quad 1.)$$

where W denotes the quantity of heat produced (within a given time) in a wire, the resistance of which is $l$ for the strength of current $s$. We may now consider W the quantity of heat which must be produced in a given time in the wire in order to make it red hot. If this wire be replaced by one of the same metal and of equal length, but $n$ times the diameter, its surface will also be $n$ times as great, and this surface gives to the surrounding air—*cœteris paribus*—$n$ times as much heat, and therefore $n$ times as much heat, viz: $n$ W, must be evolved in the thicker wire in order to produce the same appearance of red heat. But the resistance to conductions of the wire of $n$ times greater diameter is $\frac{l}{n^2}$. Denoting by $s'$ the strength of current which makes it red hot, we obtain the equation:

$$n\,W = s'^2 \frac{l}{n^2} \quad . \; . \; . \; .$$

therefore,

$$W = s'^2 \frac{l}{n^3} \quad . \; . \; . \; . \; . \; . \; . \; . \quad 2)$$

and by combining the equations 1) and 2)

$$s'^2 = n^3 s^2$$

or

$$s' = s\sqrt{n^3} \quad . \; . \; . \; . \; . \; . \quad 3).$$

Thus, according to this reasoning, a current of 2.83 and 5.19 times the strength should be necessary in order to make red hot, wires, the diameter of which is twice or three times as great, while, according to my observations, a two and three times stronger current proves sufficient; in short, instead of equation 3), according to my observations, that of $s' = n\,s$ holds good. The deviations are far too considerable to allow of the supposition that they proceed from errors of observation.

How this difference is to be accounted for I am at present unable to decide. It is, indeed, conceivable that with thicker wires and an equal strength of current the outermost stratum reaches so low a temperature that the loss of heat is not greater than from thin wires, but that towards the interior the temperature increases so rapidly that the outer colder strata have no perceptible influence upon the appearance of the wire. Small differences, too, are lost by the defective estimation of ignition, and it is therefore to be expected that deviations from the above law relating to the thickness will be found, when the diameter is more varied than in these experiments. I intend to continue the investigation of this subject.

The laws of ignition by the galvanic battery and by the discharge of the Leyden jar differ entirely. While the strength of current must be increased in equal, or at least nearly equal proportions to the diameter, the charge in the Leyden jar has to be augmented in proportion to the fourth power of it, if the degree of ignition is to be

kept unchanged. This difference already shows that the galvanic ignition is essentially of another nature from that produced by the discharge of the jar.

§ 59. *Determination of the voltaic combination required to produce ignition in given metallic wires.*—The mean values above obtained for the quotient $\frac{s}{D}$ indicate the force of current necessary to bring a wire of 1 millimetre in diameter into the corresponding degree of ignition. Therefore, for a platinum wire 1 millimetre in diameter, to make it feebly red the force of current required is 165; to make it red hot the force of current required is 172; to make it nearly white hot the force of current required is 220.

For an iron wire 1 millimetre in diameter to make it feebly red the necessary force of current is 121; to make it red hot the necessary force of current is 135. To make a copper wire 1 millimetre in diameter red hot a force of current of 433 is required; for silver this value is 432.

I consider these numerical values only as first approximations.

Denoting by $s$ the force of current which is required to bring a wire 1 millimetre in diameter to a certain state of ignition, then $s.d$ indicates the force required to produce an equal amount of heat in a wire of the same metal whose diameter is $d$.

If once we know the force of current $a$ required to produce a certain degree of ignition in a piece of wire of given diameter, and also the resistance to conduction $r$, which this wire in connexion with the other part of the closing circuit offers, then it is easily computed what com- bination of voltaic elements, of a known nature, has to be employed for the purpose.

Let $e$ denote the electro motive force, $w$ the specific resistance of one of the cups employed. These have to be so combined that they form a battery of $n$ elements, each consisting of $m$ cups placed together. Now, the values of $n$ and $m$ are to be determined.

The cups must be so combined that the resistance of the battery is equal to that of the closing wire; the total resistance, therefore, must be equal to $2r$. We have, therefore,

$$\frac{ne}{2r} = a,$$

and

$$n = \frac{2ra}{e}$$

But the specific resistance of our battery is

$$\frac{n}{m} w = r.$$

Therefore,

$$m = \frac{n}{r} w;$$

and the value for $n$ being substituted,

$$m = \frac{2wa}{e}$$

If, for instance, a platinum wire of 1.5 metre in length and 0.5 millimetre in diameter is to be heated to redness, how many Bunsen's cups, of the electro motive force of 800 and the resistance of 10, must be used and how are they to be combined?

The resistance to conduction of a copper wire 1 millimetre in diameter and 1.5 metre in length is 1.5; that of a like platinum wire is 5.1,5 = 7,5. But the resistance of a wire of one-half the diameter is four times as great, viz: 30. This would be the resistance at the usual temperature; but when the wire is red hot it is at least twice as great, viz: 60. If we suppose that the resistance of the other part of the closing circuit is comparatively so little that it may be neglected, we have $r = 60$, and, for our case, $a = 172.0,5 = 86$. Therefore,

$$\frac{n.800}{120} = 86, \text{ consequently, } n = 12,9$$

$$\frac{12.9}{m} 10 = 60, \text{ consequently, } m = 2,1;$$

from which it follows that a battery of 12 double elements has to be employed.

It is evident from this example that in the above mentioned experiments the arrangement was not the most advantageous.

If a copper wire 1 millimetre in diameter and 0.5 metre in length is to be heated to redness, its resistance would be 1, supposing it to be twice as great at a red heat as it is at the usual temperature. If the resistance of the rest of the closing circuit is also equal to 1, its total will be equal to 2; but $a$ in this case is 433, and therefore

$$n = 2.16, \quad m = 10.8.$$

We have, therefore, to use a battery of two elements, each of which consists of 11 cups.

A more accurate knowledge of the resistance to conduction of metals at a red heat would be necessary to give a greater degree of exactness to these calculations.

In general more cups in a series will be required for producing ignition if the wires are bad conductors and of greater length, and more cups, side by side in each element, if they are good conductors and of greater diameter.

§ 60. *Ignition of metallic wires in different gases.*—Grove has made the remarkable observation that platinum wire heated to redness by the voltaic current in atmospheric air, is apparently extinguished when covered with a bell-glass, filled with hydrogen.—(Phil. Transact., 1847, pt. 1; Pog. Ann., LXXI, 196.) Since the resistance to conduction is greater in a wire intensely ignited than in one the heat of which is less intense, it was to be expected that, *cœteris paribus*, the same wire when in hydrogen would conduct a stronger current than in atmospheric air.

Grove proved the correctness of this conclusion in the following

manner: In the circuit of a constant battery besides a platinum wire, which could conveniently be surrounded by an atmosphere of different gases, a voltameter was inserted. The intensity of ignition in the platinum wire was found to be very different in the different gases, but, at the same time, the rate of the decomposition of water in the voltameter was also changed, so that in equal times the quantity of detonating gas obtained was greater as the heat evolved by the wire was less. The following quantities of detonating gas were obtained per minute in the voltameter when the platinum was immersed in the gases enumeated:

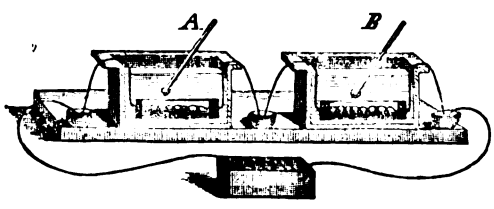
| | | |
|---|---|---|
| In hydrogen | 7.7 | cubic inches. |
| olefiant gas | 7.0 | " |
| carbonic oxide | 6.6 | " |
| carbonic acid | 6.6 | " |
| oxygen | 6.5 | " |
| nitrogen | 6.4 | " |
| atmospheric air | 6.4 | " |
| do. condensed | 6.5 | " |
| do. rarified | 6.3 | " |
| chlorine | 6.1 | " |

With the appearance of light in the wire, the heat produced in it also is greater, as is demonstrated by the following experiment: The bulb of a thermometer was placed at a certain distance from a coil of wire, which was heated to redness by a battery of 4 cells. When the coil remained in atmospheric air the thermometer rose 15° in five minutes, but when it was immersed in hydrogen the rise, during the same interval, was only 7.5°.

Poggendorf, in a note, expresses the opinion that this phenomenon may be connected with the observation formerly made by Dulong and Petit, that a heated body is more rapidly cooled in hydrogen than in atmospheric air. To me this view seems inadmissible, for if the wire in hydrogen gives out more rapidly the heat developed in it, the thermometer ought to rise more rapidly when the wire is placed in this gas, provided the quantity of heat produced in the wire by the galvanic current is always the same in whatever gas it is placed.

This experiment, however, is not yet decisive; but another one, described by Grove in a later memoir on the same subject, beyond a doubt refutes the above explanation of Poggendorf.—(Phil. Magazine, XXXV, 114; *Pog. Ann.* LXXVIII, 366.) Two glass tubes, A and B, fig. 50, 1.5 inch in length and 0.3 inch interior diameter, were closed at both ends with corks, which were penetrated by copper wires, connected inside of the tube by a spiral of platinum wire $\frac{1}{80}$ inch in diameter and 3.7 inches in length. The tube A was filled with oxygen, B with hydrogen, and the tubes were then placed in separate vessels, similar in every respect, and containing

Fig. 50.



about 3 ounces of water. A thermometer was immersed in the water of each of the vessels, and the copper wires were so connected that they formed part of the closing circuit of a constant zinc-platinum battery of 8 cells, each of 8 square inches acting surface.

When the battery was closed the wire in the oxygen became incandescent, while that in the hydrogen was not visibly ignited. The temperature of the water, which was 60° F. in both vessels at the beginning of the experiment, rose within 5 minutes to 70° in that around the hydrogen tube, and to 81° in that around the one containing the oxygen.

When both the tubes were filled with the same kind of gas the temperature in both vessels rose to the same degree.

This experiment decidedly proves that the appearance of less heat in the wire immersed in hydrogen, with perfectly identical strength of current, cannot be caused by a more rapid absorption of heat by the hydrogen, because then, on the contrary, the water surrounding the hydrogen tube ought to be heated sooner. All this indicates that, in fact, a less production of heat takes place in the wire when surrounded by hydrogen.

Grove has proved that this phenomenon is not caused by a small amount of conduction of electricity by the hydrogen; he has also demonstrated that it cannot be brought into any connexion with the other physical properties of the gases, their density, specific heat, &c.

As to the explanation of this peculiar fact, Grove endeavored in vain to find a tolerable one, and in the course of his somewhat dilated and obscure discussion arrives himself quite inconceivably at the conjecture that the difference of the gases might have a similar effect to a difference in the condition of the surfaces.. This would essentially coincide with Poggendorf's above mentioned opinion, which was propounded, however, before the experiment with the two glass tubes of fig. 50, which in the most distinct manner refutes such a view, was known to him. But Grove gives his consent to it immediately after he has himself made and described the experiment, which proves that this basis of explanation is inadmissible, and that the phenomenon cannot be deduced from differences in conduction and radiation of heat.

In my opinion the phenomenon is still entirely isolated and unexplained. I do not think it profitable in such cases to cover up our want of knowledge with dilated disquisition, in which the physical scape-goat of our days, *molecular action*, has to play the principal part.

§ 61. *Effect of ignited platinum wires on different gases.*—It is a known fact that some of the compound gases suffer decomposition in red hot tubes. Grove has produced similar effects upon these gases by the action of ignited platinum wires.—(Phil. Trans., 1847, pt. 1; Pogg. Ann. LXXI, 194.) The following is the apparatus he used for this purpose:

Into the upper end of an eudiometer tube, fig. 51, a curved platinum wire was fused, from whose extremities copper wires conducted to the two mercury cups which connected them with the poles of the battery. The gas to be examined was confined over water, and, to prevent the glass from becoming too much heated, the whole eudiome-

ter tube was immersed in a wider vessel filled with water. Sometimes the water was covered with a layer of oil one inch in depth.

Fig. 51.

Fig. 52.

When the gases had to be confined over mercury, or when a longer continuation of the ignition was necessary, the apparatus of fig. 52 was used. Here the eudiometer tube is bent, and its closed end, containing the platinum wire, immersed in a vessel filled with water or oil; the open end dipping into another vessel containing the water or mercury, used for confining the gases. With this apparatus the following results were obtained:

*Nitric oxide*, over distilled water, contracted in varying proportions to the heat. (The volume, of course, was not measured before the apparatus had entirely cooled.) In the best experiments the contraction amounted to one-third of the original volume. The remaining gas was nitrogen, and nitric acid was found dissolved in the water.

*Nitrous oxide* was decomposed into nitrogen and oxygen; the volume increased by 0.35 of the original. The full equivalent proportion or 0.5 could not be obtained.

*Carbonic acid* did not show any perceptible change.

*Ammonia* increased to double its original volume; the gas could no longer be absorbed by water, and consisted of 3 vol. of hydrogen and 1 vol. of nitrogen.

*Olefiant gas* contracted a little, and deposited carbon. The remainder was hydrogen and olefiant gas; the greater the heat the more hydrogen was formed.

*Nitrogen* remained unchanged.

*Oxygen* contracted but very little, about one-fiftieth of its volume; it might, perhaps, have contained a minute quantity of hydrogen.

*Chlorine* over water gave white fumes, and a grayish-yellow insoluble powder collected on the sides of the tube, near the platinum wire; this was afterwards found to be chloride of platinum. The greatest part of the chlorine combined with the hydrogen of the aqueous vapor, and the muriatic acid formed was absorbed by the water. When the experiment was finished the volume of gas was reduced to about one-half, and the remainder was oxygen.

With *bromine and iodide of chlorine* oxygen was evolved, (how the experiments with these bodies were performed I could not perfectly

understand.) The residue could not be examined, because it acted both upon the platinum and upon the glass.

*Hydrogen* contracted very much, sometimes to one-tenth of the original volume. The cause of this contraction was a small quantity of oxygen, with which hydrogen gas is nearly always contaminated. Phosphorus brought in to the most carefully prepared hydrogen emits vapors of phosphorous acid, shines in the dark, and produces a slight contraction. But even after this, the ignited wire produces a further contraction. The phosphorus, therefore, cannot remove all the oxygen from the hydrogen.

After this experience Grove doubts the correctness of the values ascertained for the atomic weight of hydrogen.

According to these experiments it seems that it would be more advantageous to use the platinum wire ignited by the galvanic current, than the electrical spark in eudiometric experiments.

*Hydrogen and carbonic acid* mixed in equal volumes were easily affected by the ignited wire. They contracted to 0.48 of the original volume; the residue was carbonic oxide. One equivalent of oxygen and 1 of hydrogen had, therefore, combined together.

*Carbonic oxide* exhibited a remarkable phenomenon. Carefully purified from any carbonic acid, it was exposed to the action of the ignited wire over distilled water, and its volume increased from one-fifth to one-third, according to the intensity of ignition.

When the gas was dry and confined over mercury, this increase of volume did not take place; it must have been dependent, therefore, upon the presence of aqueous vapor; and, in fact, the increase of volume was found to be caused by the formation of carbonic acid. By agitation with caustic potash or lime water the gas was reduced to exactly its former volume; but then it was found to be mixed with a volume of hydrogen equal to that of the carbonic acid absorbed. This is explained in the following manner: "Half a volume or one equivalent of oxygen derived from the vapor of the water had combined with one volume or equivalent of carbonic oxide, and formed one volume or equivalent of carbonic acid, leaving in place of the carbonic oxide, with which it had combined, the one volume or equivalent of hydrogen with which it had been originally associated."

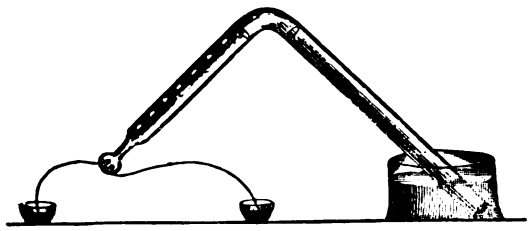
On comparing this experiment with the previous one, the singular inversion of affinity under circumstances so nearly similar will appear surprising; in the former case hydrogen abstracted oxygen from carbonic acid in order to form water, leaving carbonic oxide, while in the latter the carbonic oxide takes the oxygen from the aqueous vapor to form carbonic acid and leaves hydrogen.

A more exact idea of the nature of these reactions has not yet been obtained. By the latter experiment, in which a decomposition of aqueous vapor also took place, Grove was led to the idea that it might be possible to decompose aqueous vapor and produce detonating gas simply by means of the ignited wire. He succeeded in this as will be seen in the following:

§ 62. *Decomposition of aqueous vapor by ignited platinum wire.*—Grove discusses the decomposition of aqueous vapor into its elements in the same memoir in which he treats of the action of the ignited

wire upon the different gases. After many unsuccessful experiments this decomposition was effected by means of the following apparatus:

Fig. 53.



A bent glass tube, open at one end, (fig. 53) was connected at its other end by a narrow neck, with a bulb into which the platinum wire passed, as represented in the figure. The whole tube was filled with water previously freed from air, and its open end immersed in a vessel of water. On applying a battery of two zinc-platinum cells, the air in the bulb was expanded and expelled so that the water entered it and then soon boiled, and at a certain period the wire became ignited in the vapor. "At this instant a tremulous motion was perceptible, and separate bubbles of the size of pin-heads ascended and collected in the bend of the tube. It was not a continuous evolution of gas as in electrolysis, but appeared to be a series of jerks; the water in returning through the narrow neck formed a natural valve, which cut off by an intermitting action portions of the atmosphere surrounding the wire." The collected gas was detonating gas.

That this evolution of detonating gas can certainly not be attributed to electrolysis has been satisfactorily demonstrated by Grove. I give below the most important of his arguments.

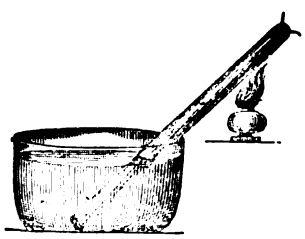
1. A battery of two cups produces in distilled water, even under the most favorable conditions, a scarcely perceptible electrolysis.

2. The decomposition did not commence until the wire became ignited.

3. When the wire was divided no gas was evolved.

Grove now endeavored to produce the decomposition of aqueous vapor in such a manner that the red hot platinum wire could only come in contact with the vapor. A glass tube, as in fig. 54, which at its closed end had a curved platinum wire melted in, was filled with water which had been carefully freed from air by long boiling and the air pump; it was then inverted in a vessel of the same water, and a spirit lamp applied to its closed extremity until the upper half was filled with vapor, which therefore surrounded the platinum wire. The wire was then brought to full ignition. After the connexion was broken and the lamp removed, the water gradually ascended again, but a bubble of the size of a mustard seed remained in the tube, and detonated when touched by a lighted match at the surface of the water trough. The experiment was repeated, the wire being

Fig. 54.



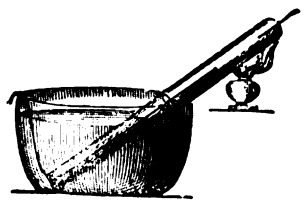
kept ignited for a longer time, but the gas could not be increased beyond a very limited quantity.

The experiment just described was repeated and the gas bubble transferred to another tube, the wire was then again ignited in vapor, the bubble formed again removed, until a sufficient quantity of gas was collected for analysis, which required the labor of ten hours. This gas was now detonated in a eudiometer and left a residue of 0.35 of its original volume, which consisted of nitrogen. The experiment was repeated several times with the same result; sometimes a trace of oxygen was found in the residue.

Here electrolysis was completely excluded; the wire was ignited in dry steam.

When in the apparatus of fig. 55 the sparks of a large hydro-electric machine were passed between platinum points through the vapor, a small bubble of detonating gas was also formed.

Fig. 55.



As in the previous experiments a whole day's work did not increase the bubble, but when it was transferred, another instantly formed. The gas similarly collected detonated and left a residue of 0.4 of its original volume of nitrogen with a trace of oxygen.

By an estimation, which could of course only be approximate, the detonating gas formed, was found to be about $\frac{1}{2400}$ of the volume of the vapor.

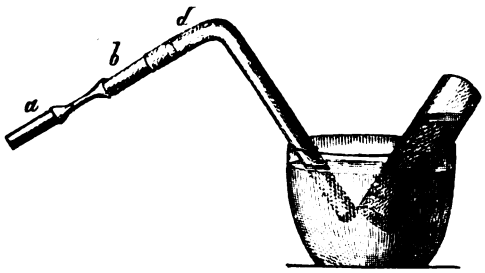
Grove considered this evolution of detonating gas not to be a specific effect of electricity at all, but of heat alone, and indeed, succeeded also in decomposing aqueous vapor merely by heat without electricity.

Omitting the less successful experiments, we shall at once proceed to those that gave very decisive results. With a constant battery of 30 zinc-platinum cells the end of a thick platinum wire was melted into a globule of the size of a pepper corn; between this and the carbon point of the negative pole the voltaic arc was taken until the gobule was again near its melting point. It was then rapidly plunged into water, freed from air, that was kept boiling by means of a spirit lamp, and into which a tube filled with the same water was inverted. Separate bubbles of gas rose into the tube. This process was repeated until a sufficient quantity of gas was collected, which, after explosion, once left a residue of 0.4; another time only 0.25 of the original volume, consisting, as usual, of nitrogen and traces of oxyen. The galvanic battery here served evidently only to bring the platinum to ignition. When melted and heated by means of the oxy-hydrogen blow-pipe, it acted exactly in the same manner. In this way more than $\frac{1}{2}$ cubic inch of detonating gas was obtained.

The heated globule is evidently, when immersed in the water, immediately surrounded by a stratum of vapor, from which then the small quantity of detonating gas is developed.

To obtain a continuous evolution of the mixed gases from water subjected to the action of heat alone, Grove constructed the apparatus shown in fig. 56; *a* and *b* are tubes of silver 4 inches in length and 0.3 in diameter, connected by two platinum caps to a tube of a perforated platinum wire 0.125 inches diameter, the bore having the diameter of a large pin; *a* is closed at the extremity, and to the extremity of *b* is fitted, by means of a coiled strip of bladder, the bent glass tube *d*. The whole apparatus is filled with water freed from air, and, after having expelled the air from *a* by heat, the end of the glass tube was immersed in a vessel of boiling water. Heat is now applied by a spirit lamp, first to *b* and then to *a*, until the whole boils; after this the flame of an oxy-hydrogen blowpipe is directed upon the middle part of the platinum tube *c*, and when this has obtained a high degree of ignition gas is evolved which, mixed with vapor, soon fills the whole apparatus, and escapes through the open end either into the open air or into a gas collector.

Fig. 56.




The gas thus obtained left, after its detonation, a residue of 0.3 of its volume, consisting of nitrogen and a trace of oxygen.

That, in all these cases, the remnant consists of nitrogen is caused by the great difficulty or even impossibility of absolutely removing all the air from the water.

This series of phenomena is very remarkable. While the detonating gas, under the influence of heat, is condensed to vapor of water, we have here exactly the opposite action, though to a very limited extent only. The elaboration of the more intimate conditions and relations of this decomposition of aqueous vapor, which might lead to an explanation of the phenomenon, we must leave to the future.

When Grove says "that these experiments afford some promise of our being, at no distant period, able to produce mixed gases for purposes of illumination, &c., by simply boiling water and passing it through highly ignited platinum tubes, or by other methods," I cannot help expressing my doubts whether, even if the manufacture on a large scale should succeed, the detonating gas thus produced could give more light and heat than the fuel consumed in its formation.

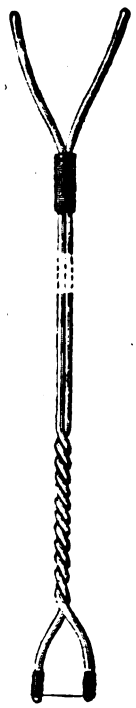
§ 63. *Application of galvanic ignition to blasting rocks.*—It has for a long time been known that gunpowder can be ignited by the electric spark, as shown long ago by Franklin, and still repeated as one of the usual experiments in the lecture room. But, although blasting by means of frictional electricity is therefore possible, still there are too many difficulties in the way of the process to allow us to expect its introduction into practice.

Hare was the first to employ the ignition of metallic wires by the galvanic current in blasting. But his apparatus was too complex and

unsuited for every day use by common laborers, and, therefore never was used to a great extent.* In consequence of the many fatal accidents in mines and quarries, Roberts, of England, directed his attention to this subject. After many endeavors he succeeded in making the application of the galvanic current to blasting so simple that his process deserves general commendation. It was first described in the Mechanics' Magazine, May, 1842, p. 353.—(Dingler's Polytech. Journal, LXXXV, 275.) We shall be brief in this notice, as probably much that is contained in the article mentioned is well known.

In order to avoid the necessity of arranging before each charge the fine iron wire between the conductors, Roberts invented cartridges, a number of which can always be prepared in advance. They are made in the following manner: two copper wires, each 10 feet long and 1 line thick, well covered with waxed cotton or woolen yarn, are placed side by side close together; at one end they are twisted together for about 6 inches, as represented in Fig. 57, and their extremities left to form a fork, a little over ½ inch long, with its extremities ½ inch apart; the ends of this fork are then laid bare, cleaned by filing, and the fine iron wire is stretched between them. The iron wire is wound around the extremities of the copper wires, and may then be soldered with tin.

Fig. 57.



The iron igniting wire is, of course, destroyed by each explosion; to save the conducting copper wires they are firmly tied together with twine, as indicated in the figure, and then wound around with fine binding wire.

The body of the cartridge is a tin tube, 3 inches in length and ¾ to 1 inch in width, soldered and perfectly water tight. (A glass tube might probably answer.) The fine iron or steel wire is placed at about the middle of the cylinder, and is kept in its place by means of a cork which closes the cylinder, and through which the twisted copper wires pass. It is best to cut this cork lengthwise, and after putting the wire between the two halves, to press them into the tube. But on account of the thickness of the conducting wires it will probably be found more convenient to make a groove in the cork for their reception. The cork being put in so that the fork is nowhere in contact with the sides of the tube, it is covered with a good cement. Roberts recommends a mixture of one part beeswax and two parts rosin.

The tube is then to be filled through its open end with dry sporting powder, and closed by another cork, which must also be covered with the cement.

Figure 58 represents the entire cartridge. Figure 59 shows how the cartridge is placed in the hole.

* Our author could not possibly have seen Dr. Hare's description of his apparatus when he wrote this sentence. The original notice (Am. Jour. Science and Arts, vol. 21, p. 139, 1832,) shows that Dr. Hare's apparatus was not complex, and that it was essentially the same as that here described as the contrivance of Roberts. G. C. S.

through a long circuit, including the fine igniting wires, with the negative pole, so that B may be considered the negative pole and A the positive. The current circulates and produces ignition in the iron wire as soon as A and B come into contact.

In order to pull the disk B towards A from a distance, two pieces of twine fastened to B pass through holes in the disk A, and at E are connected with the long string that reaches to the place whence the person who is to close the circuit stands. An accidental discharge is prevented by a peg F between A and B, which must be removed before the two disks can come in contact. But besides lessening the danger this method of blasting offers other considerable advantages; it enables us without much difficulty to explode powder under water. For this purpose the entire charge is to be enclosed in a water-tight tin box and this put in the place where its action is desired.

The application of galvanic ignition is also very advantageous when great masses of rock are to be blasted. Formerly, in such cases, it was necessary to use a heavy charge in one great mine, but several smaller properly distributed charges would produce a much greater effect if they could be ignited simultaneously. This can now be done by the aid of the galvanic current; the connecting wires have only to be so arranged that all the holes are at the same time in the circuit. In this way immense effects have been obtained in England.

What power the battery must have in each case can easily be ascertained from preceding sections. From section 59 can be ascertained what force of current is required to make the thin iron wire incandescent, (the diameter of which must of course be known,) and after computing the resistance in the conducting wires, it is easy to determine how many cups or pairs of plates of any give point must be used and how they must be arranged to produce this force of current.

§ 64. *The voltaic arc.*—By the construction of the constant battery, the production of the arc of light which Davy was the first to observe is greatly facilitated, and hence this interesting phenomenon has been several times investigated, though much is still left for further researches.

De la Rive paid great attention to the galvanic arc; we take the following from his elaborate treatise on this subject, published in Phil. Trans., f. 1847, (Pogg. Ann., LXXVI, 170.)

The voltaic arc can be produced not only between carbon points but also between points of different metals. It is greater with the more fusible or oxydisable metals, as zinc or iron, than with platinum or silver. The size of the arc of light is proportioned to the greater or less facility with which the substance of the electrode disintegrates; for since this phenomenon is produced by minute particles of matter carried over from one electrode to the other, its formation must necessarily be favored by a less cohesion of the electrodes; this is also the reason why, under otherwise like conditions, the greatest arc of light is always obtained between carbon points. The transference of the matter is always from the positive to the negative pole. In the air and with metallic electrodes, the deposit upon the negative pole

always consists of oxydized particles of the metal used as the positive electrode.

If the negative pole has the form of a plate, while the positive pole is a point, the deposit of the transferred matter upon the plate forms a very regular ring, the centre of which is the projection of the point upon the plate.

When the arc of light is taken between a metallic point and an opposite surface of mercury, the latter, when positive rises in a cone, but forms a cavity when negative. In this case it is very difficult to observe accurately the minutiæ of the phenomenon, on account of the great quantity of mercurial vapor evolved.

De la Rive made experiments with plates and points of platinum, iron, silver, and copper, but I cannot enter upon the details of the experiments, because there is much that is not clear to my mind; in many cases, for instance, I cannot see in the individual experiments the proof and confirmation of the generalizations announced. A repetition of these experiments and an accurate description, illustrated when practicable with figures, seems therefore very desirable.

§ 65. *Intensity of light of the voltaic arc.*—Casselmann has made experiments upon the intensity of light of the voltaic arc, which have been described in the memoir already mentioned. They were afterwards also copied into Poggendorf's Annals.—(*Pog. Ann.*, LXIII, 576.) The photometer used in his experiments was constructed upon the same principles as that described in the third edition of my *Lehrbuch der Physik*, vol. II, 674. The carbon pieces, between which the arc was taken, were of the same composition as that used in the cylinders of Bunsen's battery, but prepared also in other ways, as some of them were saturated in solutions of nitrate of strontium, boracic acid, &c., and then intensely ignited. Thus prepared they gave a very steady light, differently colored, according to the solution employed; and the carbon points could (with a Bunsen battery of 44 cups) be removed to a distance of 7 to 8 millimetres before it disappeared, while the unsteady light of unprepared carbon went out at a distance of 5 millimetres.

A tangent compass was at the same time inserted into the circuit, so that for each measurement of the intensity of light the corresponding force of current could be determined.

The brightest parts of the whole light, it is well known, are at the points of the two pieces of carbon, upon which the arc rests. In the following table the intensity of the whole light is compared with that of a stearine candle, and for each kind of carbon, with the points once at a very small, and then at the greatest possible distance. The values of the force of current are reduced to the chemical unit.

| | Distance of the carbon points. | Force of current. | Intensity of light. |
|---|---|---|---|
| | *mm.* | | |
| Unprepared carbon | 0.5 | 95 | 932 |
| | 4.5 | 68 | 139 |
| Carbon with nitrate of strontium | 0.5 | 120 | 353 |
| | 6.75 | 88 | 274 |
| Carbon with caustic potash | 2.5 | 101 | 150 |
| | 8.0 | 82 | 75 |
| Carbon with chloride of zinc | 1.0 | 80 | 624 |
| | 5.0 | 67 | 159 |
| Carbon with borax in sulph. acid | 1.5 | 72 | 1171 |
| | 5.0 | 64 | 165 |

This table shows that on increasing the distance of the points the intensity of light and the force of current decrease. By most of the substances with which the carbon had been prepared, the arc of light was made more steady and allowed of a greater distance of the points, but the intensity was not greater, except with the carbon prepared with borax and sulphuric acid.

But the results in the above table are only approximately accurate, since the changeable position of the most brilliant points at the origin of the arc may have prevented the light from acting with its full intensity upon the photometer. In another series of experiments, an abstract of which is given in the following table, this error was avoided, the arc of light having been directed towards the photometer by means of a magnet. In these experiments only 34 Bunsen's cups were used, the distance of the carbon points was not changed, and the intensity of the light was measured for different degrees of force of current.

| | Force of current. | Intensity of light. |
|---|---|---|
| Carbon with boracic acid | 41 | 198 |
| | 52 | 252 |
| | 57 | 298 |
| Carbon with sulphate of soda | 38 | 178 |
| | 41 | 203 |
| | 52 | 346 |
| | 60 | 460 |

The carbon saturated with sulphate of soda was not heated to redness before use.

It follows from these experiments that the intensity of light increases in a somewhat greater ratio than the force of the current.

By this, or rather by a similar equivalent formula, Fizeau and Foucault computed the results of their observations, and thus obtained the following relative values for the intensity of the sources of light.

| | |
|---|---|
| *Sun-light*, in August and September, at noon, with a clear sky | 1000 |
| *Carbon-light*, produced by 46 Bunsen's zinc-carbon cups..... | 235 |
| *Lime-light*..... | 6.8 |

The lime-light appears to be surprisingly little; but Fizeau and Foucault found with the common photometrical method a similar relation between the lights from lime and carbon. No other comparative measurements are known to which these can be referred; a careful experimental re-examination of the matter is, therefore, desirable.

In reference to the change of the intensity of the carbon-light with the number and magnitude of the galvanic elements we find the following data in this memoir: While a battery of 46 Bunsen's elements gave an intensity of light of 235, this was increased to 238 only when the number of cups was augmented to 80; but a battery of 46 triple cups gave an intensity of 385, after having been already in action for one hour.

In consequence of the rapid alteration of the fluid—the diluted sulphuric acid becoming gradually a solution of sulphate of zinc—the force of the battery, and with it the intensity of the arc of light produced by it, decreases rapidly. While 80 cups afforded at first an intensity of 238, this after three hours was diminished to 159.

It is to be regretted that these physicists have not measured the force of current corresponding to the intensity of light, whereby the value of the above given numerical relations would have been very much enhanced.

§ 66. *Production of heat by the voltaic arc.*—The heat developed at the poles, between which the arc is taken, is entirely too great to be attributed to the mere passage of the electric current through these conductors. According to the experiments mentioned in § 57, a current, to make a platinum wire of 0.75 *mm.* in diameter incandescent by its passage, must have at least a force of 160. Therefore, to make a platinum wire of 3 *mm.* in diameter only white-hot requires, at the very least, the enormous force of current of 640; and yet with the current of a Bunsen's battery of 44 cups and a force of 80 to 100, we can produce an arc in which the point of a platinum wire of more than 3 *mm.* in diameter may easily be melted into a globule, if used as one pole of the battery while the other is formed by a carbon point. The combustion of carbon is so trifling that it cannot essentially contribute to the great heat produced; besides, the fusion of the platinum wire by the galvanic arc takes place in a vacuum as readily as in the open air.

The electric current, therefore, besides producing heat by its mere passage through the conductors, in forming the arc must act at the pole itself to produce heat in some other way, of which as yet we know nothing.

The development of heat is not equal at the two poles of the arc; it is greater at the positive than in the negative. De la Rive, in his

treatise already mentioned, in § 64, adds, in reference to this fact, the following observations:

When, in forming the arc, a positive metallic point is opposite to a negative plate, the point becomes ignited throughout, while on inverting the poles the negative point is heated at its extremity only.

If two points of the same metal are opposed to each other the positive one becomes more intensely ignited, and over a greater length. If they are of different metals, of course that one becomes most intensely ignited which is made of the worst conducting metal.

To this category belongs also an observation of Walker, made with a Daniell's battery of 160 cups.—(Trans. of the Lond. Electr. Soc., pp. 65 and 71; Pog. Ann., LV, 62.) He laid the pole wires crosswise, but so that after the contact they were again moved to a little distance from each other, and a short arc of light passed between them. Under these circumstances the positive end of the wire, from the point of crossing, became so intensely hot that it softened and bent, while the negative end remained comparatively cold.

Experiments on the heating effects of the voltaic arc have been made on the greatest scale by Despretz. He collected, in Paris, 500 zinc-carbon cups, and arranged a battery of 124 elements, each consisting of four Bunsen's cups. When a piece of sugar carbon, in a glass globe exhausted to 5 millimetres, was brought between the poles it became intensely ignited and the globe was covered with a dry, crystalline black powder. Carbon from gas retorts produced the same effects. This shows a sublimation of the carbon.

Despretz thinks too that he observed traces of fusion of the carbon. At any rate his experiments show that carbon evaporates more readily than it melts. He believes that it could be melted in metallic vessels in an atmosphere of compressed nitrogen. Similar in behavior to carbon are lime, magnesia, oxide of zinc, &c. Alumina, rutil, anatase, nigrine, oxide of iron, &c., form at first small globules, but afterwards evaporate.

Previous to these experiments with 496 cups Despretz had used a battery of 165 elements, and combined the heat of its arc with that of the oxy-hydrogen blow-pipe and of the sun concentrated through a sectional lens 90 centimetres in diameter. The effect of the galvanic battery was increased by the addition of the other sources of heat.—(Comptes Rendus, July, 1849, No. 3; Dingler's Polytechnic Journal, CXIV, 342.)

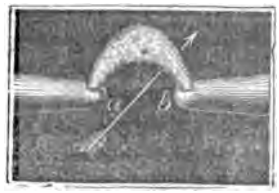
§ 67. *Influence of magnetism upon the voltaic arc.*—That magnetic forces have an influence upon the position and form of the arc has already been observed by Davy, and it is known that this arc is affected by a magnet in the same manner as a movable conductor when a galvanic current is passing through it; the terrestrial magnetism, therefore, must also act upon it. By the motion of the heated air the arc of light is always carried upwards, so as to form a curve, convex above. If we conceive a perpendicular plane to be passed through the carbon points lying horizontally, the action of terrestrial magnetism will be such that the highest point of the arc will never be in this plane, but on one side or the other.

Casselmann, in his treatise already mentioned, in § 56, gives experiments on this subject. If, with opposite horizontal carbon points, the current was passing—

| From | The deviation of the apex was towards |
|---|---|
| N. to S. | E. |
| W. to E. | N. |
| S. to N. | W. |
| E. to W. | S. |

This can be easily deduced. In fig. 61 *a* and *b* represent the two horizontal carbon points between which the arc is produced. If now we imagine a perpendicular plane passed through *a* and *b*, and a straight line to pass perpendicularly through the plane between these points, as indicated by the arrow, then a steel needle placed in this line would be magnetized by the current of the arc, and its N. end would be at the point of the arrow when the positive current is passed from *a* through the arc towards *b*. But by the influence of the terrestrial magnetism the N. end of the needle would dip, and in like manner also the arc will be inclined from the vertical plane towards the direction of the N. end of the needle.

Fig. 61.




If *a* is to the west, and *b* east, the inclination will be toward the north when the current is passing from *a* to *b*; but with a direction of the current from east to west, the north end of the supposed magnetic needle would be on the south side of the arc, and the latter, therefore, would incline toward the south.

By means of this supposed magnetic needle we can, under all circumstances, determine in what manner the arc will be affected by terrestrial magnetism or either pole of a magnet, or what must be its position when placed between the two poles of a horse-shoe magnet.

If, instead of one of the carbon poles, a magnetic bar is used, so that the arc is formed between carbon and steel, the arc rotates around the magnetic pole according to the same laws which apply when a movable current rotates around a fixed magnet. The first notice in reference to this rotation of the arc is given by Walker, in the "Transactions of the London Electrical Society" from 1837 to 1840.—(Pog. Ann., LIV, 514.) De la Rive also has made experiments on the influence of magnetism upon the voltaic arc, but in a different way. Their description is found in the memoir mentioned already in § 64.

I shall quote here from De la Rive's memoir literally, in order to give a characteristic example of his want of precision in writing, by which his papers are frequently rendered obscure, as before mentioned:

"If two points of soft iron, acting as electrodes, be both placed within a helix formed of thick copper wire of several coils, the voltaic arc developed between the two points of iron ceases the moment a strong current is passed through the wire of the helices, and reappears if this current be arrested before the points have become cold. The arc cannot be formed between the two iron points when they are magnetized, whether by the action of the helices or by that of a powerful

magnet, unless they be brought much nearer to one another, and the appearance of the phenomenon is then entirely different. The transported particles appear to disengage themselves with difficulty from the positive electrode, sparks fly with noise in all directions, while in the former case it was a vivid light without sparks and without noise, accompanied by the transfer of a liquid mass, and this appeared to be effected with the greatest ease. It is of little moment with respect to the result of the experiment whether the two rods of magnetized iron present to that part of their extremities between which the luminous arc springs the same magnetic poles or different poles.

"The positive electrode of iron, when it is strongly magnetized, produces, the moment that the voltaic arc is formed between it and a negative electrode of whatever nature, a very intense noise, analogous to the sharp hissing sound of steam issuing from a locomotive engine. This noise ceases simultaneously with the magnetization.

"For the purpose of better analyzing these different phenomena, I placed an electro-magnet of large dimensions and great power in such a manner as to enable me to place on each of its poles, or between them, different metals destined to form one of the electrodes of the pile, while one point of the same metal, or another substance, acted as the other electrode. I have alike employed as electrodes, placing them in the same circumstances, two points of the same metal, or of different metals. The following are the results which I have obtained: A plate of platinum was placed on one of the poles of the electro-magnet, and a point of the same metal was placed vertically above it; the voltaic arc was produced between the plate and the point, the plate being positive and the point negative. As soon as the electro-magnet was charged a sharp hissing was heard. It became necessary to bring the point nearer to the plate to enable the arc to continue, and the bluish circular spot which the platinum plate presented became larger than when the experiment was made beyond the influence of the electro-magnet.

† "The plate was made negative, and the point positive. The effect was then totally different. The luminous arc no longer maintained its vertical direction when the electro-magnet was charged, but took an oblique direction, as if it had been projected outwards towards the margin of the plate.†† It was broken incessantly, each time accompanied by a sharp and sudden noise, similar to the discharge of a Leyden jar. The direction in which the luminous arc is projected depends upon the direction of the current producing it, as likewise on the position of the plate on one or other of the two poles, or between the poles of the electro-magnet. A plate and a point of silver, a plate and a point of copper, and generally a plate and a point of any other metal, provided it be not metal too easily fused, present the same phenomena.

"Copper, and still more silver, present a remarkable peculiarity. Plates of these two metals retain on their surfaces the impression of the action that took place in the experiments just described. Thus, when the plate is positive, that portion of its surface lying beneath the negative point presents a spot in the form of a helix, as if the melted metal in this locality had undergone a gyratory motion around a centre, at the

same time that it was uplifted in the shape of a cone towards the point."

The first part of this is clear; not so the last two paragraphs. The passage between † and †† appears to indicate that the oblique direction of the arc of light only occurs when the plate is negative and the point positive; but somewhat further on we read that the direction in which the luminous arc is projected depends upon that of the exciting current. It should, therefore, take place when the plate is positive and the point negative. Besides, an obscure allusion to the rotation of the arc is found in this passage, but so obscure that one not previously acquainted with the phenomenon could form no idea of it from this representation. That the Genevan physicist, in penning this passage, actually had this rotation in view is evident from the conclusion of the last paragraph. Similar faults frequently occur in De la Rive's treatises; his description rarely gives a clear and intelligible representation of the phenomenon. It is much to be regretted that in this way the results of many a beautiful and difficult experimental research are only imperfectly presented to those engaged in physical studies.

§ 68. *Use of the galvanic light for illumination.*—It was to be expected that the great intensity of the galvanic carbon light would soon lead to the idea of employing it for illumination after its production was so much facilitated by the invention of the constant batteries.

Deleuil several times made public experiments with this kind of illumination. At first he illuminated the pavilion of a mansion at the Pontneuf, in Paris, with 98 zinc-carbon elements. Acherau made similar experiments in the Place de la Concord.—(Dingler's Polytech. Journal, vol. 91, p. 324.)

Though the intensity of the galvanic carbon light is enormous, and although a battery of 48 Bunsen's elements produces as much light as 63 common gas burners, yet the use of the galvanic light for public illumination appears unfit for practical application for the following reasons:

An immense quantity of light is here emanating from one single point, and therefore very strong contrasts between light and shade will be produced; the darkness in the shade will be the more unpleasant just on account of its contrast to the dazzling light. At any rate, the illumination obtained from 63 gas burners, perfectly distributed, will be more uniform and agreeable than an equivalent light concentrated in one point.

Another objection to the application of the galvanic carbon light, is the difficulty of keeping its intensity uniform for a long time.

In consequence of the formation of sulphate of zinc the conducting power of the fluid decreases so rapidly that the force of the current, even in half an hour, becomes considerably weaker than it was at the beginning. But, apart from this, the maintenance of the battery is extremely expensive, because much more zinc is consumed than the current itself requires, and the nitric acid acts destructively upon the metallic rings around the carbon cylinders. It is true the disadvantages of this action of the nitric acid could be avoided by the use of Daniell's elements, but then the battery must be considerably enlarged to obtain the same effect.

In an economical point of view, therefore, the galvanic illumination of streets, halls, theatres, &c., does not appear advantageous. But there is yet another difficulty; the management of the battery and of the whole apparatus is too complicated to be confided to such persons as generally have charge of the illumination; the carbon points are continually changing, and their position, therefore, must be continually regulated in order to keep the light uniform and prevent its extinction. It is difficult to accomplish this regulation by mechanical means, though different contrivances have been proposed for the purpose. Le Molt, for instance, obtained a patent in England, in 1848, for an apparatus for galvanic illumination, in which carbon disks, with the form represented in fig. 62, take the place of the points. Two of these disks are placed with their sharp edges opposite each other; their axes rotate uniformly by means of clock work, and their distances are regulated by a metallic spring.

Fig. 62.

It is therefore scarcely to be expected that the application of galvanism to public illumination will have any practical success. But Donné and Foucault have obtained very favorable results from their experiments, in which the galvanic carbon light was substituted for the incandescent lime in the so called gas microscope.

A tolerably complete description of the photo-electric microscope of Donné and Foucault may be found in the 4th edition of Pouillet, Elements de Physique Experimentale, &c., vol. II, pp. 746. We can here only indicate the most essential parts of the apparatus. The luminous arc is produced between sticks of carbon cut from the hard carbon of gas retorts; they are made in the shape represented in fig. 63, the negative electrode being pointed and the positive blunt. These carbon pieces are so held that their position can easily be regulated.

Fig. 63.

A general idea of the arrangement of the illuminating apparatus of this microscope may be gathered from the diagram fig. 64. *a* is a concave mirror of an aperture of about 1 decimetre, and a radius of 1.6 decimetre. The carbon light is at *b*, a little nearer to the mirror than *c*, the centre of its curvature, and somewhat higher, so that the rays emanating from *b* are collected at *f*, where the minute object to be magnified is intensely illuminated. The system of lens through which the magnified image of the object is thrown upon a screen 4 to 5 metres distant is precisely the same as in the solar microscope.

Fig. 64.

To diminish the great heat at *f*, a vessel is placed between the mirror and b, the sides of which are made of polished plate glass; it it is filled with a solution of alum by which a great part of the calo-

rific rays is absorbed without sensibly lessening the intensity of the light.

The image of the arc of light itself, as produced at *f* by the concave mirror, may be taken as the object to be magnified through the lens, but then the magnifying power must be lower. Thus, a highly magnified image of the arc of light is obtained upon the white screen, and all the phenomena accompanying it can be observed with ease.

But the magnified image of the galvanic arc of light can also be produced by much simpler means; it has only to be brought directly near the focus of a lens of 1 to 3 centimetre focal distance. Of course, care must be taken that the carbon light is so inclosed that no light falls upon the screen, except that which passes through the lens.

§ 69. *Galvanic illumination of mines.*—The remarks on galvanic illumination in general are also applicable to the proposal to illuminate mines by the light produced by means of galvanism; there is scarcely much practical success to be expected. Because the galvanic carbon light can be produced in a vacuum and even under water. Boussingault believed that it could be used instead of Davy's safety lamp in mines where inflammable gases make open lamps dangerous. But in mines an intense light at any one place is never wanted, but a feeble one at many different places. The same objection is to be made to De la Rive's proposal to pass in a hermetically closed glass balloon the positive current from an upright carbon cylinder to a metallic one placed vertically above it.—(Dingler's Polyt. Journal, XCVIII, p. 158, and 232; Moniteur industr., 1845, No. 961 & 965.)

Grove proposed, instead of the carbon light, the ignition of a platinum wire by galvanism in a hermetically closed glass vessel.—(Dingler's Polytechnic Journal, XCIX, p. 201; Phil. Magazine, Dec., 1845, p. 442.) He gives to the wire the form of a spiral, and thus employs a greater length of it in a smaller space; and this arrangement has the further advantage that on account of the less rapid cooling the coiled wire is more intensely heated with an equal force of current than the same wire when extended in a straight line.

Grove does not give any details as to the length and diameter of the wire used, or of the precise construction of the spiral. With two to three constant elements a uniform light was obtained during several hours. Grove experimented (and read) by this light; but this notice gives only a very imperfect idea of the illuminating power of the apparatus. In mines this light will probably be sufficient, and the proposition therefore appears to be a more practical one than the application of the carbon light, especially on account of the small number of constant elements required for the purpose. But still, even this apparatus will be more expensive and complicated than Davy's safety lamp, and consequently its general introduction into use is scarcely to be expected.

King uses, instead of the platinum spiral, a strip of very thin platinum foil, and makes it incandescent by the galvanic current.—(London Journal of Arts, June, 1846, p. 348; Dingler's Polytechnic Journal, CI, p. 12.)

§ 70. *The galvanic spark.*—Most of the observers who have experimented with the galvanic arc have noticed that the two poles must first

be brought into contact before the current can be produced. After the carbon points have once been in contact, they may be separated from each other and then the luminous arc is formed. The arc also can be produced by discharging the spark of a Leyden jar between the carbon points, instead of bringing them into contact, as has been observed by Daniell, (Phil. Trans., 1839, 89; Pog. Ann. LX, 379,) and previously by Sturgeon.—(Ann. of Electr., VIII, 507; Pog. Ann. XLIX, 122.) The latter believes that this experiment originated with Herschel. The formation of the current in this case is evidently caused by conducting particles carried from one pole to the other by the spark.

Even the powerful batteries which have been used to produce the luminous arc have not yet sufficient tension to effect the passage of a spark through the smallest distance.

Jacobi found by accurate measurement that the poles of a battery of 12 zinc-platinum elements could be brought to within 0.00005 inch of each other without a spark passing.—(Bulletin of the Petersburgh Academy; Pog. Ann., XLIV, 633.)

Gassiot obtained distinct sparks from his great water battery.—(Phil. Trans., f. 1844, pt. I, pp. 39; Pog. Ann, LXV, 476.) This remarkable battery consisted of 3,520 glass tumblers, each containing a zinc rod and a copper cylinder. They were charged with rain water. The tumblers were distributed upon 44 oaken boards, every 11 of which were combined in a stand, similar to the shelves of a book case, and were supported by four strong pillars. Especial care was taken to secure perfect insulation, the glasses were varnished and placed upon glass plates, and these as well as the boards were in like manner covered with varnish.

It might be expected that this battery, when the circuit was unclosed, should exhibit in a decided manner the phenomenon of tension, and, in fact, the leaves of a gold leaf electroscope diverged already, when yet at a distance of 2 or 3 inches from one of the poles.

As soon, however, as the battery was closed, all signs of tension disappeared. When the poles of the battery were brought within 0.02 inch of each other sparks continually passed between them. In one case this phenomenon continued day and night for five weeks without interruption. Several months after its construction the battery showed no signs of decrease in strength.

Since the ordinary galvanic batteries have no striking distance at all, it is evident that the appearance of light observed in opening and closing even simple batteries, must be an entirely different phenomenon from that of the common electric spark.

In the memoir just mentioned, Jacobi states it as his opinion that the usual galvanic spark is a phenomenon of ignition and combustion; the extremely fine points which first come into contact and permit the conduction of the current, become incandescent and burn, and thus produce, according to Jacobi's opinion, the phenomenon of light. There is no doubt that with more vivid sparks such ignition and combustion really do occur, but then the phenomenon is no longer a simple one; in closing and opening a battery the spark is observed under circumstances which make ignition and combustion very improbable.

Neef has shown that this appearance of light, when occurring simply without the action of secondary currents, is neither a common electric spark, viz., a spark passing from one pole to the other, nor can it be attributed to a combustion of metal.—(P. A. LXVI, 414.)

In his so called magnet electrometer, as described in the 3d edition of my "*Lehrbuch der Physik*," vol. II, p. 251, a continual closing and breaking of the current takes place at *c* which is accompanied by a corresponding appearance of the light. But in this form of the apparatus the observation of the phenomenon is rendered difficult by the width of the hammer which strikes the platinum plate. In a very convenient modification of this apparatus by Desaga, in Heidelberg, which will be described hereafter, a platinum point is substituted for the hammer, so that the contact is made and broken in rapid alternation between a platinum point and plate.

When the apparatus is in action, light is observed, at the place of separation, which, on account of the rapidity of the oscillation, seems to be continuous. To the naked eye, when protected from the daylight, the light appears violet, whether the positive current pass from the point to the plate or inversely; but the point of light is so extremely small that Neef was induced to examine the phenomenon with the microscope. By the aid of this instrument he found that the light always appears at the negative pole only.

These observations are best made with a microscope which magnifies 25 to 50 times, which permits the objective to be removed to at least 1½ inch from the point of light.

When the positive current passes from the plate to the point, the latter appears enveloped in violet light, while the plate remains entirely dark.

At the lowest extremity of the point within the continuous violet light there appear single, extremely fine, dots of dazzling white light with a sort of swarming motion; and towards the upper extremity of the violet envelope there is also seen light of the same color but of much greater intensity, flashing out, and yet no passage to the other pole could be observed. The last mentioned flashing gradually disappears as the force of the current decreases.

When the current passes in the opposite direction, and the point, consequently, is positive, it remains quite dark and the violet light is spread upon the plate around the point of nearest approach. In this case, too, there is no spark, strictly so called, to be observed, and the uniform violet glimmering light can scarcely be attributed to a combustion of the platinum. Besides, Neef also especially remarks that this phenomenon of light takes place at the negative pole only, while the greatest heat is always developed at the positive pole.

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35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 136.

# MEMORIAL OF JOHN C. WATROUS.

JUNE 10, 1858.—Ordered to be printed.

*To the honorable the House of Representatives of the United States.*

The memorial of the undersigned, John C. Watrous, Judge of the District Court of the United States for the Eastern District of Texas—

HUMBLY REPRESENTS: The House having at the present session authorized to be taken from its files, and referred anew, sundry memorials, heretofore presented, praying for his impeachment; and the inquiry therein prosecuted by its Committee on the Judiciary not having led to any definite result, either of negativing or affirming the charges made, and a great body of evidence on the subject being now ready to be reported, the undersigned respectfully prays permission to submit herewith a written exposition of the law and the facts of the whole case for the consideration and judgment of the House.

The undersigned takes occasion, in the outset, solemnly to aver that all the charges of misconduct in office preferred against him are unjust and untrue, and beyond that to declare that he has never consciously been guilty of any act, official or unofficial, tending to tarnish his honor either as a magistrate or as gentleman; and that he is ready, at all proper times and places, to encounter any charges or allegations derogatory to his character, from whatever quarter they may come, and especially to co-operate in pursuing the fullest inquiry into all matters touching his official conduct, within the purview of the constitutional duty of the House of Representatives. If it were otherwise, he would be unworthy to hold the elevated office of a judge of the courts of the United States.

He received the appointment of judge of the district court of Texas from the hands of President Polk, at the time of the accession of that State to the Union. During the twelve years which have since elapsed, he has performed the duties of his office with all due diligence, and with fidelity, as he confidently believes and avers, to his oath and to the law.

His duties, he may be permitted to say, have been more than ordinarily difficult and responsible. Until a very recent day, the district in which he officiates embraced the whole of the great State of Texas. Owing to the imperfect organization of the judicial system of the United States, he discharged the functions of a circuit as well as a district court. He entered upon office in a State which had come into

existence as an independent republic, separated by revolution and war from the Mexican republic. Its population was composed in good part of the more adventurous of the people of the United States. Its jurisprudence was peculiar, consisting of a combination of that of England and Spain, of the civil and of the common law, in their original condition, or as modified in the different States of America. Its land-titles were involved in controversy by the circumstances attending the transition of the State from dependence to independence, and by the supervening necessity for the reconcilement of the codes of proprietary concessions under the crown of Spain; of colonization under the authority of the Mexican Republic; of revolutionary and head-right or settlement grants by the Republic or State of Texas. And the judicial task devolved upon him by these circumstances, arduous in itself, was rendered yet more so by the fact that in his court, of course, were litigated questions of debt and other claims proferred by citizens of other States against those of Texas.

These circumstances, and especially the last, namely, the relation of the federal court to claims of citizens of other States against those of Texas, are the cause, he is confidently assured, of unjust complaints and false charges against him, which were propagated by interested parties at the very commencement of his judicial career, and were made to assume a plausible seeming in the eyes of the legislature of Texas, and which, at this late period, have been resuscitated and brought before the present Congress of the United States to be seriously considered, with newer matters, as a question of impeachment.

The constitution provides that "the President, Vice President, and all civil officers of the United States shall be removed from office on impeachment for and on conviction of treason, bribery, or other high crimes or misdemeanors;" that "the trial of all crimes, except in cases of impeachment, shall be by jury;" that "the House of Representatives shall have the sole power of impeachment;" that "the Senate shall have the sole power to try impeachments;" that "judgment in cases of impeachment shall not extent further than removal from office and disqualification to hold and enjoy any office of honor, trust, or profit under the United States; but the party convicted shall nevertheless be liable and subject to indictment, trial, and punishment according to law." Moreover, "cases of impeachment" are excepted from the pardon power of the President.

It is apparent on the face of these provisions of the constitution that their object is to punish official misconduct of civil officers of the government, and to inflict upon them punishment which shall be not only special and unpardonable, but also in addition to such punishment for the same act as shall have been provided for by the ordinary laws of the land.

It would appear, also, that the acts of official malfeasance, for which the special and additional punishment by impeachment exists, are such only as are also punishable by the ordinary laws of the land. To that effect is the express language of the constitution—"treason, bribery, and other high crimes and misdemeanors." The same conclusion is deducible from the fact that the party convicted on impeachment "shall nevertheless be liable and subject to indictment, trial, and

punishment according to law." Indeed, any other conclusion would involve the assumption, which can by no possibility be admitted, that arbitrary punishment for offences undefined may exist in a system of constitutional government like that of the United States.

Nay, the very word "impeachment," as adopted in the constitution from the laws of England, has and can have no larger signification than this. "Acts of parliament to attaint particular persons of treason or felony, or to inflict pains and penalties beyond or contrary to common law to serve a special purpose," says the authoritative expositor of the common law, are, "to all intents and purposes, new laws, made *pro re nata*, and by no means an execution of such as are already in being. But an impeachment before the lords by the Commons of Great Britain, in Parliament, is a prosecution of the already known and established law."—(Blackstone, vol. 4, p. 259.)

I respectfully submit, also, that, in the exercise of the power of impeachment, it is the duty of the House of Representatives to look beyond the question of mere probable cause of accusation, and to institute inquiry of actual guiltiness. I know it is common to speak of the House of Representatives in this relation as the "grand inquest." This expression is one of loose analogy only, not of precision or truth. The House of Representatives *finds* an impeachment, it is true, and in this respect its action bears resemblance to that of a grand jury; but here the resemblance ceases, for the House of Representatives also accuses and prosecutes; and it might therefore, with as much verity, be denominated an attorney general as a grand inquest. No such phrase, nor any one expressing or conveying the same idea, is to be found in the constitution.

Accordingly, it is announced as the received rule of public law in the latest work of authority on the subject that the House, in the exercise of the power of impeachment, acts "not like a grand jury, but in its ordinary legislative form of proceeding;" (Cushing's Legislative Assemblies, p. 985;) that is to say, the House inquires into the whole question before it, in the case of a petition or motion for impeachment, just as it does in regard to any other legislative matter of fact, with open doors, with hearing of both sides, either directly or by committee, with free debate—in a word, with purpose and with endeavor, by all proper and ordinary means of investigation, to ascertain the truth or falsity of the charge presented to its consideration.

Whatever doubt on this point may have been permitted heretofore, there can be none at the present time. It is notorious that in Great Britain the House of Commons hears the accused either by committee or at the bar of the House. This was admitted and fixed in the last great case of impeachment there, that of Lord Melville. It was determined still more authoritatively in the United States, in the last great case of impeachment here, that of Judge Peck. The doctrine is declared, in the name of the House of Representatives, by the leading manager, Mr. Buchanan, now President of the United States, in the following words, uttered at the bar of the Senate:

"The voting of an impeachment in the House of Representatives should never be a mere *ex parte* proceeding *there*, though it ought always to be so considered *here*. The power of impeachment is too

important, the expense to the nation, both in time and money, is too great to justify the House in proceeding upon mere *ex parte* testimony presented by a private accuser. Neither the investigating committee nor the House should rest satisfied with such evidence alone. They ought to go beyond this rule, and examine so much testimony as to create a rational belief that the accused is guilty."—(Peck's Trial, p. 427.)

Mr. Buchanan, in these remarks, suggests a distinction, the disregard of which, it is conceived, is the source of prevalent errors on the subject. The accusation of the House is to be considered by the Senate as an *ex parte* one when presented there for trial; but it is not to be considered or treated as an *ex parte* one when it is before the House on the question of bringing in or presenting articles of impeachment. That conclusion is dictated by considerations of justice to the party accused, but still more by considerations of dignity of the House, and its duty to itself, to the Senate, and, in general, to the government and people of the United States.

The House of Representatives, therefore, it is humbly submitted, is not to content itself with inquiring if there be probable cause of accusation; it is not to proceed *ex parte*; it is to investigate the broad question of guilt or innocence; it is limited in this inquiry to charges of malfeasance in office, and of specific acts of high crime or misdemeanor, recognized by law, and capable of being produced in distinct articles of impeachment; of the actual truth of which the House, on its conscience and honor, is to be satisfied before carrying them up to the bar of the Senate.

Nevertheless, and in disregard of justice and of parliamentary law, when, at the last Congress, the memorials which are now before the House accusing the undersigned of high crimes and misdemeanors, were first received and considered, the charges were heard by a committee of the House *ex parte*. On that *ex parte* hearing, a criminatory report was made, composed largely of matters not official, and not in any sense constituting high crimes and misdemeanors; and with the report of the committee a volume of *ex parte* evidence was printed, consisting of imperfect records of judicial proceedings, and placed in the series of the documents of the government. If that House had gone farther in this direction, and had proceeded *ex parte* to frame articles of impeachment against him, the undersigned would have had less cause of complaint, being confident that his official integrity and his personal honor would thus have been vindicated long since by a full and impartial trial at the bar of the Senate. But in consequence of this action on the part of the last House, which, by its committee, professed to proceed *ex parte* as a grand jury, and yet, in violation of all the rules applicable to such a proceeding, printed the *ex parte* evidence taken before it, the undersigned has been subject to the injury of being forced to encounter the prejudices, which thus had been diffused among his countrymen, and may possibly have reached the members of the present Congress.

The undersigned, however, notwithstanding the circumstances of disadvantage to him under which, for the reasons stated, he comes before the House, does not hesitate to appeal to, and to rely upon, its

exalted sense of justice, in the consideration of the charges against him now a second time presented to the House.

Three memorials praying for the impeachment of the undersigned, each of them presented in a previous Congress, have been called up in this House, and referred to its Committee on the Judiciary. Of these memorials, the first, that of William Alexander, had been considered in the thirty-second Congress, (1851–'52,) and by it rejected, in effect; and that decision has, on its committee's report, been confirmed by the present House. The other two memorials, one in the name of Jacob Mussina, and the other in that of Eliphas Spencer, are now, upon a divided report of its committee, to undergo the judgment of the House.

The memorial subscribed by Jacob Mussina, like that subscribed by Eliphas Spencer, as appears by the evidence before the committee, is morally and really the act of Simon Mussina. He, as himself testifies, prepared, drafted, blocked out both memorials. He appears here, not as counsel to conduct a prosecution, but in the anomalous character of the agent of two prosecutors, not apparently in virtue of any power of attorney, if there could be a power of attorney for such a purpose, but on his personal declaration. As such agent, though not a professional person conversant with the law, he yet presumes to prefer charges of imputed legal errors on the part of the undersigned; and with still greater temerity he presumes to prefer numerous charges of fact, of all which, as he admits on oath, he has no personal knowledge. The extraordinary circumstance of the volunteer personation of Jacob Mussina and Eliphas Spencer by Simon Mussina is important, as it will hereafter be seen, to be borne in mind, in appreciating the matters of charge contained in the two memorials.

The memorial in the case of Jacob Mussina suggests numerous charges in form, reducible to four only, in substance, namely:

1. Imputed errors of law in the trial of a suit in chancery before the undersigned, entitled Cavazos and others against Stillman and others, upon which alleged errors of law corrupt partialit is inferentially imputed.

2. Imputed oppression as to the appeal of the case to the Supreme Court.

3. Imputed oppression in a case incidental to this, that of the United States against Mussina.

4. Imputed irregularities in the summoning of jurors for service in the district court.

I will take leave to speak of this fourth charge first, disposing of it in a very few words

This matter of charge is independent of any of the particular facts, of personal relation, which concern either Jacob Mussina or Eliphas Spencer, or the special interests of Simon Mussina. It alleges that, at the June term of the court, 185 3, the undersigned made an order directing the marshal not to summon jurymen, for the court to be held at Brownsville, from the counties of Cameron, Starr, Webb, and Hidalgo, which are within the judicial district of Brownsville; and that such jurors were not drawn by ballot, as required by the statutes of the State of Texas, in conformity with the acts of Congress.

The facts are these: Sundry suits were pending at Brownsville, instituted by Mr. William G. Hale, of Galveston, as counsel for the plaintiffs, against persons residing in the district of Brownsville. Mr. Hale desired to have these cases transferred for trial to Galveston, on account of the difficulty of obtaining impartial jurors in that neighborhood, because of the common interest of the inhabitants in the questions at issue. Mr. Power, acting for the defendants, opposed this, arguing the inconvenience of carrying numerous witnesses to Galveston; and accordingly, on written application by him and others, it was ordered that the venue for the next term of the court should run to counties other than those constituting the district of Brownsville. This order was founded on obvious reasons of justice, and perfectly consonant with the express letter of the law, which requires that jurors for service in the courts of the United States "shall be returned, as there shall be occasion for them, from such parts of the district, from time to time, as the court shall direct, so as shall be most favorable to an impartial trial."—(Act of Congress of September 24, 1789, sec. 29, Laws United States, vol. 1, p. 88.)

As to the mode of drawing jurors, that, if irregular, was the act of the marshal, as fully appears by the evidence before the committee, and not of the court. In whatever form done, it was never made the cause of exception or challenge by any party, plaintiff, or defendant, in any cause whatever. But there was not, it is conceived, any irregularity in the matter; for, as proved before the committee, jurors for the court were obtained in a manner conforming as near as possible to the statutes of Texas, in obedience to the provision of the federal law, that "jurors in all cases, to serve in the courts of the United States, shall be designated by lot or otherwise, in each State respectively, according to the mode of forming juries therein now practised, so far as the laws of the same shall render such designation practicable by the courts or marshals of the United States."—(*Ut supra.*)

To comprehend thoroughly the case of Cavazos against Stillman, it is necessary to give account of the nature and history of that case.

It was a suit in equity in the district court of Texas, instituted at the January term, 1849, and decided at the January term, 1852. It was a bill of peace. The original parties were Rafael Garcia Cavazos and wife and six others, all in name and in fact citizens of the Mexican republic, complainants; and Charles Stillman, Richard Fitzpatrick, Patrick C. Shannon, Samuel A. Belden, and W. W. Chapman, all in name and in fact citizens of Texas, defendants.—(Transcript, p. 1.)

In the course of the preliminary or incidental proceedings in the case, the bill underwent several amendments. Four of the plaintiffs were made defendants by their own consent, (Trans., p. 42,) they appearing as such in person or by counsel, (Trans., p. 27,) in accordance with a rule of practice in chancery, sanctioned by the Supreme Court.—(Wisner *vs.* Barrett, Washington's Reps., vol. 4, p. 642; Greely *vs.* Smith, Story's Reps., vol. 3, p. 76.) The complainants dismissed their bill as to two of the defendants, Chapman and Fitzpatrick.—(Trans., p. 205.) And Jacob Mussina, styled "citizen of

the said State of Texas," was made defendant, (Trans., p. 42,) on the express application of his agent, Simon Mussina —(Mr Hale's Statement, p. 7.) All the defendants appeared.—(Trans., pp. 43, 31, 56, 146, 148.)

The matter in dispute was a part of the lands constituting the site of the town of Brownsville. Of the defendants, Stillman, Belden, and Mussina claimed to hold under the city of Matamoras, on the ground that the land, although originally the property of Cavazos or his ancestors, had been taken from them by process of expropriation for public uses as *ejidos* or commons of that city. The plaintiffs, on the other hand, stood on their title by ancient grant from Spain to José Salvador de la Garza, with possession, denying the alleged expropriation to the public uses of the city of Matamoras, and of course denying all pretended title derived under such assumed expropriation, and demanding to have their title quieted by authority of law.—(Mr. Hartley's testimony, p. 408.)

Simon Mussina, as attorney in fact of Jacob Mussina, participated in all the proceedings in person, and by successive or joint counsel of more or less eminence, namely: Messrs. Johnson and Swett, F. H. Merriman, Volney E. Howard, M. M. Potter, O. C. Hartley, and Alexander and Atchison, (Trans., *passim*, Testimony, pp. 304, 402, 270,) and the case was fully tried, and fairly and completely argued on its merits, and with a vast body of exhaustive evidence, (Trans., p. 258,) and finally decided on its merits, to the effect that Cavazos had the superior title, and that of course Mussina and his particular associates, Stillman and Belden, had none.—(Trans., p. 1062.) The proper legal consequence followed, of a decree to give peace to the title of Cavazos.

The undersigned feels entirely confident that any competent jurist who shall take the pains to examine the transcript in this case will concur with him in conclusion. In fact, the legislature of Texas did subsequently, by act of February 8, 1852, confirm the grant in question to the heirs and assigns of José Salvador de la Garza. And as to the counter claim of Stillman, Belden, and Mussina, that whole matter came, by the act of Mussina himself, before the supreme court of the State of Louisiana, which adjudged, June term, 1856, not only that the title of Cavazos was good as against Stillman, Belden, and Mussina, but also and especially that, as between himself and his codefendants, Mussina had no title whatever, nor any interest in the cause.—(Mussina *vs.* Alling, Louisiana Annual Reps., vol. 11, p. 568.)

Mussina took no appeal from the decree of the district court, and made no proper movement to take any until some time in January, 1857, a few days before the expiration of the five years allowed him for that purpose by the act of Congress.—(Mussina Petitioner, Howard's Reps., vol. 20, p. —.)

Shannon took an appeal July, 1856, four and a half years after the decree, but did not take it lawfully, as expressly decided by the Supreme Court.—(Shannon *vs.* Cavazos *et al.*, Howard's Rep., vol. 20, p. —.)

Now, it is upon such a case, and so situated, that, for imputed technical errors of the judge in the course of the trial, Simon Mussina,

in the name of Jacob Mussina, charges corruption by inference only from such imputed legal errors; for there is no proof, not a tittle nor shadow of evidence, to justify the charge. But it is perfectly manifest that corruption is never to be imputed from the mere act of erroneous rulings at *nisi prius*. If it were so, what judge would escape the charge? His errors, if any, are to be corrected on appeal, if material to the case in the judgment of the Supreme Court.

And if the undersigned were corrupt in the case, in whose favor and by whom was he corrupted? Not by or for the winning party. Mr. Hale, the counsel for the complainants, pronounces the allegation a scandalous falsehood, and declares that if any such intimation be applied by Mussina to him he will prosecute for libel or perjury.—(Statement, p. 8.)

The undersigned need hardly say that he also, for himself, repels the false charge with indignation and scorn; and that he has no interest, directly or indirectly, in the cause, or in common with any of the complainants. He decided the case, after a long and patient hearing, and with ample consideration of everything said in it by or for Mussina, and he decided it as he thought, and now thinks, correctly; and for such just and rightful decision of the case he is no more subject to the imputation of corruption than was, in like circumstances, and for a like decision in substantially the same case, the supreme court of the State of Louisiana.

And did the undersigned err in any of his rulings in the case as alleged by Mussina? This he denies, and he prays the attention of the House to the imputed errors.

1. First, it is alleged that he acted unjustly in "sustaining the bill of complaint, after the master had reported that the soliciter of the complainants had no authority to institute the suit, from which no appeal was taken," (meaning, apparently, to which no exception was taken.)

This statement is incorrect, and substantially untrue. The motion to which it refers was made by two of the defendants only, Fitzpatrick and Shannon, and by them afterwards withdrawn.—(Trans., p. 40.) Of course the whole question fell to the ground, and neither called for nor could receive any *sustaining* act on the part of the undersigned.

2. Secondly, it is alleged that the undersigned ordered that certain of the complainants, who, by the sworn averments of the bill, were citizens of Mexico, should be stricken from the bill (as complainants) and made defendants, by averring on the record that they were citizens of Texas.

That is incorrect, and in substance untrue. It was by consent that these parties became defendants, and they voluntarily appeared as such. There was no sworn averment of the bill as to their citizenship; nor is the point material. There might lawfully be alien defendants as well as plaintiffs by consent, (Mason *vs* Ship Blaireau, Cranch's Rep., vol. 2, p. 240; Piquignot *vs*. Pennsylvania Railroad, Howard's Rep., vol. 16, p. 104.) And, if it were otherwise, that would not affect the jurisdiction of the court as to other competent parties. (Conolly *vs*. Taylor, Peter's Rep., vol. 2, p. 566, and other cases.)

3. Thirdly, it is alleged that the court proceeded in the case without proper averments of citizenship, and though one of the parties in question was incompetent by non-age.

That is incorrect. These parties all appeared voluntarily by answer or counsel, the party under age by his guardian. Besides which the decree did not impair any rights of these parties, and they only could object—Mussina cannot for them.—(Harrison *vs.* Uraun, Story's C. C. Rep., vol. 1, p. 64.) Of course, they not objecting, their personal character is a matter which does not concern the undersigned, nor can it be of any importance to the House of Representatives.

The undersigned will dispose here of a question, which, though not distinctly presented by the memorial as a ground of charge, yet has occurred to him as one possible to enter into the mind, and that is, whether, considering the alienage of the complainants, they were incompetent to sue for the possession of land in Texas.

That important question of law has been much debated of late years. It was not very distinctly raised, nor prominently presented, in the case of Cavazos *vs.* Stillman. And yet, in one of the motions of the defendant, Mussina, the point appeared; it being said there that "the court has no jurisdiction over the cause under the treaty of Guadalupe Hidalgo."—(Trans., p 240.) The allusion here undoubtedly was to the present question, and was so understood by the court; the disability of aliens in certain respects being removed by that treaty, and so removed in Texas, if it applies to that State. Hence the undersigned was compelled to reflect on the subject, and, so reflecting, he came to the conclusion that probably the treaty does in this respect apply to Texas; but if not, yet, on the general principles of law, it was competent for an alien to sue for land in that State.

Did he err in this? If so that was for the Supreme Court to determine. In fact the undersigned had occasion subsequently to consider the same question (distinctly and specifically presented to him for consideration) in two cases, upon full argument by counsel, and he came to the same conclusion on the point as in the case of Cavazos *vs.* Stillman. In the first of these cases, the Supreme Court has since decided that the right of aliens could not, in their opinion, be sustained on the letter of the treaty of Guadulupe Hidalgo, (McKenney *vs.* Saviego, Howard's Rep., vol. 18, p. 235;) but in the second of these cases the Supreme Court maintained the right of the alien unequivocally, upon general principles, and so in effect confirmed and ratified the conclusions of the undersigned.—(Jones *vs.* Mr. Masters, Howard's Rep., vol. 20, p. ——.)

4. Fourthly, it is charged that the undersigned admitted the deposition and numerous important affidavits of William G. Hale, the solicitor of the complainants, that Mr. Hale's testimony was material, and that he was interested in the cause.

The statement is incorrect in fact. Most if not all of the affidavits related to the service of papers, in regard to which the affidavits of interested parties are constantly admitted in chancery.

As to the deposition of Mr. Hale, that was received in obedience, as the undersigned conceives, to the settled rules of the law of evidence, it appearing that the interest of Mr. Hale was contingent only, not

direct; not by the direct legal operation of the judgment in the case. In all the books of authority it is laid down that such an interest as his does not disqualify.—(See Greenleaf's Ev., vol. 1, sec. 390; Gresley's Equity Ev., p. 252.) Numerous cases might be cited to the same effect. It will suffice to refer to a very late case in the State of Texas itself, in which the same point was ruled in the same way by the supreme court of that State.—(Brigham *vs.* Carr, March, 1850, M S.)

5. Fifthly, it is charged that the undersigned permitted Robert H. Hord, counsel for defendants, a witness covertly interested against them, to testify at the hearing of said cause, and sustained his refusal to answer a proper and legal question to show that he had collusive interest adverse to the memorialist.

It is most remarkable that the proceeding of the court in this matter should be made subject of complaint. Mr. Hord stated on his *voir dire* that he was interested both ways, but more for the defendants than for the complainants, by whom he was called. Surely, if the complainants were content with a witness so situated, the defendants might well be, and especially the witness being their own counsel. But Mr. Hord was a competent witness, according to all the authorities, on the principle of balanced interest; (Greenleaf's Ev., vol 1, sec. 391;) and no question of the relation between him and his co-defendants could avail to deprive the complainants of the right to his testimony.

Of course the interest of Mr. Hord was not a "covert" one; it was openly avowed. Nor was it "a *collusive* interest adverse to the memorialist," but a notorious one, Mr. Hord denying in his examination that Mussina had any interest whatever in the lands in dispute, and that declaration of his being made good subsequently by the decision of the supreme court of Louisiana. But all that is of no concern to the undersigned.

6. Sixthly, it is charged that the undersigned took and held jurisdiction, so as to enter up a decree against Mussina, although by the latter's answer, it appeared that he was a citizen of Lonisiana.

There is in this charge such a combination of bad faith, perversion of facts, and misstatements of law, as when exposed, cannot fail to excite the surprise of the House.

Jacob Mussina was made a defendant at the express request, as already stated, of Simon Mussina. In truth it was Simon Mussina, acting in the name, and, to use the language of the memorialist, under the "covert" of Jacob Mussina, by the style of "citizen of the State of Texas."

Now, it is well settled, by decisions of the Supreme Court that such an averment is conclusive, unless negatived and disproved by regular proof, (Sheppard *vs.* Graves, Howard's Rep., vol. 14, p. 505;) and the objection must be pleaded in abatement, or presented by some equivalent motion for the consideration and determination of the court.—(Jones *vs.* League, Howard's Rep., vol. 18, p. 76.) But Mussina made no such plea or motion. He raised questions at successive stages of the case, regarding the citizenship of other parties, and denied jurisdiction as to them; he never suggested the least doubt

of the competency of the jurisdiction in so far as regarded himself. He undertook, without right, to except for others; he did not, where perhaps he might have done it, take exception in his own right.

Simon Mussina, as attorney in fact for Jacob, was present during the final hearing, as well as in the preliminary proceedings of the cause. Numerous motions, affidavits, or other legal acts were made or presented in his name, and by his agent or solicitors. No exception to the jurisdiction was taken in his behalf. How, under such circumstances, was the undersigned to say or assume that he was not a competent party, because not a citizen of Texas?

It is true, as the transcript now shows, that in his answer Jacob Mussina is described as a citizen of Louisiana, whether purposely, and with some ulterior thought, or whether by inadvertence, does not distinctly appear. But the attention of the undersigned was not called to this fact, nor was he conscious of its existence. If he had been that would have made no difference, in view of the rule of law that the averment of citizenship in the amended bill could be contradicted only by special plea and proof.

To appreciate the injustice of this charge, it needs only to reverse the facts, and to suppose the undersigned to have refused to consider Mussina as a competent party defendant, because described in his answer as a citizen of Louisiana. That would, indeed, have been a volunteer act of injustice, not called for by any motion or plea, not sanctioned by the law; and such an act, to the contrary of the frivolous charge now made, would have afforded good cause for the animadversion of the House.

Such, and such only, are the rulings in the case, the imputed illegality of which is made the ground work of a charge of inferential corruption. Two imputed errors in ruling upon the competency of evidence in a transcript of more than one thousand pages! The undersigned ventures to say that after years of sedulous and malevolent criticism have been applied to this case, the fact that only two subjects of exception of this class, and two or three as to the character and competency of parties, are now indicated, is the strongest possible evidence of the unimpeachable integrity of his acts in the premises. He appeals with confidence to the judgment of every member of the House acquainted with legal proceedings, whether by practice at the bar or by the discharge of judicial functions on the bench—he appeals to the files of the Supreme Court and the reports of its decisions in support of the assertion that the imputed errors in this case, instead of being such, and so many as to be suggestive of corruption, are the contrary of this, and are much less, in number and in quantity, than the zeal of disappointed litigants and of ingenious counsel are accustomed to find in voluminous chancery suits reviewed by the Supreme Court.

The futility of the allegation on this point is further shown by the significant fact that, as the printed transcript of the case evinces of the rulings in the case before the hearing, there were nineteen in favor of the complainants and eleven in favor of the respondents; and at the hearing twenty-two in favor of the complainants and twenty-three in favor of the respondents. In such a state of things, is it not the

mere wantonness of unjust accusation to select two or three only out of this mass of rulings, and thereupon to argue or infer corrupt partiality? With what semblance of reason or fairness can it be assumed that one of the defendants in a chancery suit is always and necessarily right in every point or motion which he makes, and that his co-defendants, as well as the complainants, are always and necessarily in the wrong in every point or motion? Or will the House take up this transcript of 1,087 pages and rehear this case, as if on appeal? If so, must they not hear the parties? Is one of the parties, and he alone, to be heard against all the other parties, under the pretence of an application to the House for the impeachment of the undersigned? Would not that be to the utter perversion of all justice in the land? Would not that be mere usurpation of the office of the Supreme Court of the United States?

If in the preparation, hearing, and rendition of decree in this case, the undersigned erred, the parties aggrieved had their remedy in law. Objection occurs in the progress of the case to the entertainment here of a bill of peace. Certainly, if there be any question calling for such a form of remedy, it is where the controversy involves the title of the entire site of an inhabited town. But if the court erred in entertaining the bill, that was for the Supreme Court to say. So with regard to the question of jurisdiction, and of the competency of the complainants to seek relief in the form admitted—questions affecting the decree itself, and which the court therefore reserved as the transcript shows, to the final hearing, with the whole case before it; if the undersigned erred in this, the parties had their remedy at the bar of the Supreme Court.

The undersigned conceives that in all this he decided rightfully, according to the law and the evidence before him; but if it were otherwise, he humbly submits that the case cannot be tried anew by the House of Representatives.

If aggrieved by the decree in the case, why did not Mussina appeal to the Supreme Court, either in conjunction with the other defendants or alone, if they refused to co-operate, as he well might, according to the manner of proceeding familiar to practitioners in the courts of the United States?—(Forgay *vs.* Conrad, Howard's Rep., vol. 6, p. 201; Todd *vs.* Daniel, Peters' Rep., vol. 16, p. 521.)

He alleges, indeed, and makes the allegation a subject of charge against the undersigned, that the court, by rendering its decree at January term, 1852, was guilty of "embarrassing, if not entirely defeating," the right of the memorialist to an appeal, according to law.

The utter groundlessness of this charge is rendered self-evident by the fact that, whatever might have happened at that term, the party still had five years in which to claim an appeal, and that he took no step to that end until a few days before the expiration of the five years. It is insulting to the sense of the House to pretend, as the memorialist does, that an appeal was or could have been defeated, or even embarrassed, by any possible incident limited in time to the term at which the decree was rendered. But what were these incidents which, occurring at the time of the rendition of the decree, prevented an appeal at any time during the whole of the next five years?

The memorialist alleges, in the first place, that it was reported on information derived from the undersigned that no court would be held at that term; and he speaks afterwards of "the statement of the said judge in this regard." There is not a word of evidence in the case to support this allegation, and the allegation is untrue; the undersigned gave no such information; he made no such statement.

In the second place, the memorialist alleges that the undersigned pronounced the decree at that term, without doing any other business on the chancery side of said court. That is untrue. It is in evidence that the undersigned made eleven orders in chancery at that term, in addition to seventy-seven other orders in various cases before the court.

The memorialist further alleges that, by reason of his not expecting a decree at that term, he omitted to attend for the purpose of claiming an appeal. This allegation improperly assumes that an appeal could be taken only at that term, whilst in fact it could be taken at any time during the subsequent five years. But in truth the memorialist had no right or reason to presume or suppose that the decree would be delayed; for the record shows that, at the previous term, when the cause was heard, an order was made expressly designating the next term as the time for the rendition of the decree.—(Trans., p. 257.) And by the oral evidence taken by the committee of the House it appears that Simon Mussina was present when that order was made, and that the postponement, though resisted by other parties, was granted in deference to the wishes and interests of Jacob Mussina.

It is in evidence, also, that Mr. Atchison, one of the counsel of Mussina, had notice of the actual time of the decree, and objected to its being rendered then, not because of the absence of Mussina, but that of another of his counsel, Mr. Howard. But the undersigned having already, against the remonstrance of other parties, delayed his decree for the space of six months, could not, consistently with his public duty, longer delay it, and especially not for a reason so entirely futile as the absence of a single one of the many counsel of Mussina.

In addition to this, it appears that the court remained in session for nearly two days after the rendition of the decree, affording to counsel ample time to claim and perfect an appeal, if they had seen fit.

There is another series of incidents relating to the question of appeal, which figure largely in the evidence before the committee, and to which the undersigned begs the careful attention of the House.

Patrick C. Shannon, one of the defendants, took an appeal, in July, 1856, as hereinbefore stated, by his solicitor, Mr. Philip C. Tucker. The undersigned has been informed, and believes, that at that time Mussina was invited to join in the appeal, but refused. Acting, however, it would seem, on this occasion, as upon so many others in the matter of inquiry before the House, in the name of others rather than in his own person, so as to have the benefit of their acts without the responsibility, Simon Mussina assumed the charge of Shannon's appeal, and entered the same with the clerk of the Supreme Court. What is singular, he presented it as the appeal of Mussina as well as of Shannon. That representation was of course contrary to the

truth. And it does not appear, save by his own declaration, what authority, if any, Simon Mussina had to represent Shannon. That is a matter the more questionable, if it be true, as the undersigned has been assured and believes, that Shannon had actually deceased prior to or during the performance of these acts by Simon Mussina in his name.

However this may be, it was apparent on the examination of Shannon's appeal that it could not be sustained, because it had been taken without joinder of his co-defendants, and yet without summons and severance. For this cause the appeal was dismissed at the late term of the Supreme Court.

In view or in anticipation of this event it was, and not before, that Mussina undertook to take an appeal from the decree in favor of Cavazos. He professes, in his memorial, to believe that the decree was invalid on its merits, as well as for defect of parties, want of jurisdiction, erroneous rulings, and corruption of the court. And yet he lies by, and takes no appeal or other steps for the lawful assertion of his pretended rights, while pursuing side issues of claim of damage against his co-defendants in another State, and side issues here of impeachment of the undersigned; and the undersigned most respectfully submits to the House, upon the evidence before its committee, that the professed attempt at appeal, which he at length made, was a pretence only, a simulated application for appeal, devised for the purpose of having new cause of reproach against the undersigned, and of thus prejudicing him in the eyes of the House.

The facts in this respect are as follows: A few days before the expiration of the five years for appeal in the case, that is, in January, 1857, Mr. Atchison, who had previously appeared in it at an earlier period, and especially at the moment of the rendition of the decree in January, 1852, but then only to take captious exception to the time of rendering the decree, Mr. Atchison now, in the last month of the five years, presented himself to the undersigned at chambers for the professed purpose of taking an appeal in behalf of Mussina The undersigned inquired whether the five years had expired; and, on the reply that they had not, said, in substance, that the party had a right to appeal, and that it would be granted as of course, at any moment, on notice to the adverse counsel and appearance in court. The undersigned has no recollection, and does not believe that the subject was ever again mentioned to him by Mr. Atchison, either in court or at chambers. Mr. Atchison says that he did once mention the subject in court, from his place at the bar; but that statement is not corroborated by any other witness, and is contradicted by several persons, who could not but have been aware of the fact if it had occurred. Mr. Atchison says that the suggestion as to the opposite counsel was made in court, and that thereupon he abandoned the matter, because he knew that the opposite counsel were engaged in another court. Although several days yet remained in which to enter an appeal, he gave no notice to the opposite counsel; he made no tender of bonds; he took no steps to authenticate, verify, or make notorious his pretended inability to enter the appeal; he in effect sacrificed the interests of his client, and threw away the case, simply, on his own showing, because

of the suggestion of the court to notify counsel, which he deliberately omitted to do. Mr. Atchison further pretends that his application for appeal being on file, he expected the court to *report* to him on the subject. Is it credible, is there any human being who can for a moment suppose that any such application, under such circumstances, put off to the last week of the five years, and then abandoned for reasons so palpable insufficient, and even frivolous, was made in good faith, or for any other object than to raise false color of imputation to the prejudice of the undersigned?

Mussina, and Mr. Atchison for him, had for nearly five years slept on the purpose of appeal, which, Mussina pretends, he was prevented from taking in 1852, because of the unexpected rendition of the decree then, after eight months' notice that it was to be rendered at that time; by not being at court at that term his purpose was embarassed and defeated; it could not be done then, in his absence, by Mr. Atchison; he did not think of it again for five years, less one month, when the supreme court of Louisiana had baffled his plan of making gain out of the loss of his cases in Texas, and after he found that Shannon's appeal could not be used by him as a "cover;" he was not now at Galveston, but Mr. Atchison could, at this time, act in his absence, although no sureties of appeal had been designated by Mussina, or engaged or applied to by Mr. Atchison; and after all, although professing to desire an appeal, he abandoned it, rather than give notice of the application to the counsel of Cavazos! And so the game of false pretences was played out in Texas.

It was not yet complete, however, here. To maintain the appearance of intended appeal, he applied to the Supreme Court here for a mandamus to compel the undersigned to act, and that application was heard on return and affidavits, by which it appeared to the Supreme Court, and that Court so decided, that there had been no refusal of appeal by the undersigned.

But, in this, the Supreme Court had a further duty to perform. It had to say, and it did say, that the application of Mussina was one, which the undersigned was bound to hear only in court or on notice to counsel, and could not receive otherwise; because it involved the forms of summons and severance, without which it would stand in the same predicament as the defective appeal taken by Shannon.—(Mussina *vs.* Watrous, Howard's Rep., vol. 20, p. ——.) Mr. Atchison, if the reasons he gives for abandoning the appeal are true, was unaware of that; and thus it appears that his action, with the professed explanation of it, does as little credit to the professional intelligence of Mr. Atchison as to his good faith.

Indeed, the idea upon which Mr. Atchison professes to have acted in abandoning his application, that when, to save important interests in a court, notice needs to be given to opposite counsel, and notice cannot be given if such counsel happens to have a cause in another court sitting in the same place, and although, even with days, perhaps many days, in which to give the notice, the idea is too absurd for serious refutation. Enough of this.

There is, there can be, but one explanation of these facts. Mussina had no interest, legal or equitable, in the lands of Brownsville. He

Brownsville, the very titles and rights on which, in the suit in Texas, they had assumed to stand against the proprietary interest of the heirs of La Garza; that the whole interest of Mussina was one-fourth part, Stillman retaining one-half and Belden one-fourth; that, although Simon Mussina was the real party interested in whole or in part, yet the name of his brother Jacob was put in the contract, Simon continuing professedly to personate Jacob; the probable reason of which was that Simon, residing in Texas, was insolvent, and Jacob, residing in Louisiana, was insolvent; and the contrivance of having Simon act in the name of Jacob, while it would be a convenient "cover" as to creditors, would give to Simon other dishonest advantages in the prosecution of his legal controversies in Texas.

The contract between Stillman, Belden, and Mussina was dated December 9, 1848. A few weeks afterwards, January 12, 1849, a suit was commenced against them by Cavazos, as heir or assignee of La Garza. Thereupon, controversy arose among the co-partners. Stillman and Belden demanded contribution and other payments from Mussina, which he did not make; upon which they claimed and asserted a forfeiture of his quarter part interest to their benefit. Meanwhile, the suit of Cavazos *vs.* Stillman was moving on in the district court. The consequence of all this was, that Stillman and Belden, by deed of December 14, 1849, conveyed their interest to Messrs. Basse and Hord, who had previously been the agents of the company; and the several parties, in the course of the months of January and February, 1850, came to an open rupture, signified by reciprocal public notices of dissolution of relation, and by a suit in equity for account, commenced by Jacob Mussina, against his co-partners, Stillman and Belden, and their former agents, Basse and Hord, in the district court of the United States. To this bill the defendants demurred, and thus it still remains in the calendar of the district court.

The suit of Cavazos *vs.* Stillman did not come to a hearing until more than one full year subsequent to the rupture between Mussina, on the one hand, and Stillman, Belden, and Basse and Hord, on the other, namely: April, 1851. That was a rupture open and notorious; a controversy of right between the parties, manifested by legal proceedings as well as by acts *en pais*, the question being whether Mussina, by his non-performance of conditions, had or had not forfeited his original interest to Stillman and Belden, or to their assignees, Basse and Hord. It was preposterous, under these circumstances, for Mussina, in the subsequent proceedings in the suit of Cavazos, to make show of imputed "collusion" of Basse and Hord with other parties to his prejudice. Avowed, notorious, lawfully asserted conflict of interest with him, on the part of his former associates and agents, would not, in any sense, be collusion against him. They, with better reason, could say that Jacob Mussina, without right or interest, was interfering in the matter to their prejudice, by deceptive and collusive action in the person of Simon Mussina.

This pretended collusion between Stillman and Belden, and Basse and Hord, was the ground of the suit in Louisiana. It is characteristic of the transaction that Mussina claimed to recover of them, not only

which has been tested in a case, tried and brought to a conclusion in the proper court, and entitled Lapsley *vs.* Spencer. The memorial consists, not so much of separate charges, like that of Mussina, as of specifications of alleged fact appertaining to the general charge.

Spencer alleges, in the first place, that he has been aggrieved in the matter by the acts of the undersigned. That is incorrect; for, by the trial of the case before the circuit court for Louisiana, and by the investigation of the law in the Supreme Court at the recent term, it appears that Spencer had no title, either by purchase, location, settlement, or any other way. Without color of title, says the Supreme Court, and a mere volunteer. And in this the court are so far unanimous that, although one of the nine judges doubts as to the proof of the title in Lapsley, yet all agree that there was none in Spencer.—(Spencer *vs.* Lapsley, Howard's Rep., vol. 20, p. .)

Simon Mussina professes in the case to be Spencer's agent, but for a purpose quite distinct from the interests of Spencer. Since the trial of that case below he has, or professes to have, entered into a contract of champerty with La Vega, for the purpose of attacking the title of Lapsley under La Vega. This, the undersigned is assured and believes, is the true relation of Simon Mussina's acts in the whole matter, and the inducement and object of both memorials; that is, the pursuit of a speculation in litigated land titles by the novel process of the instrumentality of the impeachment power of the House of Representatives.

The facts, on which this charge of Mussina in the name of Spencer is founded, are as follows:

In the year 1850, a most respectable and respected citizen of Texas, Mr. Thomas M. League, proposed to the undersigned to join with him in the purchase of a tract of land situated in the State of Texas, opposite Waco, on the river Brazos. He informed me that the title had been examined by Mr. Robert Hughes, a member of the bar of Texas, in whose judgment we both had confidence, and by him pronounced good. I agreed thereupon to join with him, and suggested, for the purpose of obtaining the means of payment for the whole purchase, the names of friends in Alabama to be associated in the enterprise, They were accordingly written to; they, by some of their number. sent to Texas to examine the land and inquire into the title on the spot, and the purchase was thus consummated; it being agreed that the associates in Alabama, who advanced the money, namely, Messrs. Lapsley, Frow, Goldsby, Price, and Plattenburg, all gentlemen of estimation in that State, should hold the title, and for the sake of convenience, in this respect, it should be vested in one of them only, Mr. John W Lapsley.

At the time of participating in that purchase, the undersigned had no expectation of litigation in the case, supposing that any possible question, which could exist in it, would have been decided in a case pending in the courts of the State, that of Hancock *vs.* McKenney.—(Texas Reports, volume 7.)

It never entered into the mind of the undersigned to imagine that the holding of a judicial office incapacitated a person to possess property. If it were so, then, as Lord Chancellor Cottenham observed

in a similar contingency, it would be necessary for every person, on assuming a judicial office, to divest himself of all possible interests in anything whatever. Such a doctrine, certainly, would not serve to augment the authority of the courts. On the contrary, it seems well that they, the official conservators of legal rights, should have a common stake in the society, by property, as well as by personal position. Such possible inconvenience as this may involve, by the occasional transfer of a cause, or omission of a judge to sit because of interest, is more than counterbalanced by other considerations of convenience. In the agricultural States, it is natural for a judge, in common with his fellow citizens, to have interest in land, as in the commercial States he may in stocks or other similar investments; and if the inconvenience be any greater in one case than in the other, certainly it is in the latter, because stock investments are of less conspicuous notoriety than land, and of more pervading legal relation to matters calling for judicial decision.

The undersigned, therefore, participated in this purchase, the only one he has made during the whole term of his judicial service, in perfect good faith, and without any thought or suspicion of wrong whatever.

When, however, subsequently to this, Mr. Lapsley, who, as the representative of the gentlemen in Alabama, had the control of the matter, found it necessary to commence suits, in order to maintain the title of La Vega, and of those holding under him, and saw fit to commence the suits in the district court, the undersigned regretted the act; he declared his interest from the bench at the return term, and so soon as the existence of the suits was known to him; he refused to make any orders in the cases, and did make none except the lawful and proper one, of the transfer of the cases to the adjoining circuit; and he has never, as he solemnly avers, done or participated in, or advised, or knowingly permitted, any act in the premises, impeaching his personal honor or his judicial integrity. He feels confident that this averment is conformable to the evidence, collected by the committee, on each of the specifications of charge.

1. Spencer's memorial imputes that the undersigned acquired this interest "secretly, and under cover of another man's name."

This is untrue, in so far as regards "secrecy" and "cover."

The purchase was in company with five persons of undisputed high character in the State of Alabama, and with participation of others in that State and in the State of Texas. It was known, at the time, to friends and to enemies alike, as proved by the testimony of Mr. Shearer and of Mr. Holman, (Testimony, pp. 144, 357,) and of Mr, Pascal, (Ibid, p. 418;) and the title was held by Mr. Lapsley, for the convenience and security of himself and his associates in Alabama, and not with any thought of concealment, or as a "cover."—(Mr. Lapsley's testimony, p. 102.)

2. It is alleged that the undersigned purchased "with the understanding and intention of litigating and determining the validity of the grant in the federal court of Texas."

That is untrue; and the allegation is not supported by a tittle of affirmative evidence, while it is negatived by the most positive and explicit testimony of Mr. League and others, as to their expectations at the

time of purchase, and negatived also by the whole of the subsequent incidents.

Connected with this is the suggestion made, that, admitting that the undersigned had no purpose of litigating this case in his own court, yet he contemplated the use of his court as a means of transferring the case to another district, that of Louisiana. That, also, the undersigned positively denies. And to support that suggestion, again, there is no affirmative evidence; and there is ample negative evidence, in the fact that he did not expect litigation at all, (Mr. League's testimony, p. 197;) that he desired, if any suits were brought, it should be in the courts of the State, (Ibid, p. 201;) that he complained, when informed that the suits were brought in the federal court, (Ibid, p. 237;) and that he caused new suits to be instituted in the courts of the State, in the hope there to try the questions involved.—(Mr. Hughes' testimony, p. 44.)

That such a possibility as the suggestion implies may occur, every federal judge knows, of course, when he acquires or continues to hold any property whatever. It is the general question, already touched upon, whether it is the duty of a federal judge not to possess any property; and the undersigned is not aware of any law of the United States which forbids a federal judge to have the same access to the federal courts as other citizens enjoy. But, however this may be, he had, he asserts, no such purpose in the present case.

3. It is alleged that the undersigned "counselled or procured the title to be made to a non-resident, thereby to confer jurisdiction on the federal court of Texas."

That he denies. The allegation is without affirmative proof; no man testifies that he counselled or procured any such thing; and it is positively negatived by the testimony explaining fully why the title in question is in the name of Mr. Lapsley.—(Testimony, p. 102.)

4. It is alleged that the suits were brought in the district court of Texas by fraudulent concert between Mr. Lapsley, Mr. League, and the undersigned.

This allegation is a graver one than at first sight appears. It imputes fraudulent conspiracy, not merely to the undersigned, but to all his associates in the purchase, and their counsel. Are the representatives from the State of Alabama, or those from the State of Texas, prepared to make the charge against so many honorable men, men of the highest character for integrity and honor in the States of Texas and Alabama? It must be, in order to charge the undersigned with such conspiracy, for, to conspire, he must have confederates in conspiracy.

But the allegation is unsupported by a title of evidence; it is a scandalous calumny, without foundation of fact.

5. It is alleged that the undersigned made "various orders" in these suits.

That is untrue. It is disproved by the records of the court.—(Testimony, Ap., p. 467.) It is disproved by all the witnesses. He openly refused to make any order in the case.—(Mr. Jones' testimony, p. 283; Mr. Cleaveland's testimony, p. 160.) Nor did he make a single order, except the lawful one, for the transfer of the cases, on motion, to the contiguous circuit.

6. It is alleged that the undersigned fraudulently and corruptly concealed his interest in the subject-matter of litigation.

That is not true. The evidence abounds with proofs of the disclosure and publicity of the fact.

The testimony, such as it is, which the memorialist has adduced to support this allegation, is of the most singular description. He shows that, in 1851, Mr. Alexander mentioned the fact of the interest of the undersigned to Mr. Pascal in confidence.—(Test., p. 417.) That, instead of proving concealment, proves non-concealment, and communication to persons in no relation of intimacy with the undersigned.

The memorialist also shows that, in 1856, the undersigned conveyed his interest to a creditor, and the grantee did not put the conveyance on record.—(Test., p. 242.) Whether the grantee did this or not is immaterial, of course, to the undersigned. It is puerile, however, to speak of this incident as a concealment, when it occurred many years after the interest of the undersigned had become a matter of universal notoriety.

The memorialist and his advisors seem to have supposed that it is the special duty of a judge, in becoming possessed of any property, to make public proclamation of the fact. That is absurd, of course. If he speaks of his personal interest, it will naturally be to his friends, or to those in relations of business with him: he is, no more than other men, called upon to go further, unless there be particular occasion or inducement.

In this case there was all ordinary, and much extraordinary, publicity regarding the interest of the undersigned.

As to ordinary publicity, it was known by many persons from the beginning, because many persons were concerned in the transaction, parties, witnesses, counsel. It was known by Mr. Pascall, as attorney of the vendor, (Test., p. 418,) and, of course, by trustees and others connected with the title. It was talked of among friends, (Test., p. 144, 359,) and among persons not friends.—(Test., p. 418.)

As to extraordinary publicity, it was declared in court at return day, April term, 1851, as testified by the counsel on both sides, Mr. Hughes, (Test., p. 24,) and Mr. Taylor, (Test., p. 384,) and by other persons, (Test., p. 160, 283, 322;) and it was entered in the records of the court as a reason for refusing to make orders.—(Test., Ap., 468.) Finally, in 1852, it was a matter of public discussion before a committee of the House of Representatives.—(Test., p. 451.)

There is no possible answer to these facts, of knowledge *en pais*, declaration in court, and entry of record, and discussion before a committee of the House. It is ridiculous, after this, for the memorialist to speak, as he does, of the long subsequent "*detection*" of the interest of the undersigned.

5. The memorialist alleges oppression in the transfer of the case to Louisiana.

I reply, that the transfer involved no oppression in fact. The evidence was all on paper. The defendant had no oral evidence. It was just as convenient to him to try the cause with counsel at New Orleans as at Galveston or Austin.

It is true that, by reason of the transfer, the case would have to go

to a jury of Louisiana. But that the question, again, whether a federal judge is precluded from possessing any property; for, if he possesses any, the same possibility of necessary transfer exists.

At the same time, the undersigned desired and hoped that a trial might be had in Texas; and it would have been, but for the refusal of the defendant's counsel to carry out the agreement for the substitution of an arbitrator to sit for the judge, in Texas.—(Test., p. 25.)

Moreover, by the transfer to Louisiana, the defendant would have the advantage of a judge of the Supreme Court to preside in the case.

The undersigned begs leave to add, in this relation, that, during the twelve years he has been on the bench, these are the only cases which have been transferred because of the interest of the judge, and only two have been transferred because of his having been of counsel in the matter litigated.

6. Suggestion has been made of the delay of the case in the district court of Texas in order to enforce a compromise. No such charge is preferred by the memorialist; but the idea occurs, in the course of the examination of witnesses, implying that it has been entertained by some members of the committee of inquiry.

In answer to this, the undersigned observes, that no affirmative proof to this effect appears in the evidence, and that it is expressly negatived by the testimony of Mr. Hughes, Mr. Lapsley, and Mr. League.

There is also negative proof, of the most decisive character, from Mr. Taylor, counsel for the defendants, who, while the case was at Austin, desired and obtained a continuance by consent, not being ready for trial, as, indeed, he was not, at the time at which it was transferred to Louisiana.

The cause of the delay to transfer the cause to Louisiana is explained by Mr. Hughes. It was on account of the agreement, made early in the cause, to have it tried by an arbitrator or substitute judge. So soon as the plaintiff's counsel found that this agreement could not be executed, he moved for the transfer, (Testimony, p. 25;) and the undersigned had no power to make the transfer of himself, and without motion.

7. The memorialist alleges that a forged or fraudulent power of attorney was used in the case, known to the parties as such, and uttered with previous knowledge and advice of the undersigned.

This charge alludes to the power of sale of Tomas de la Vega, under which the plaintiff's title was held.

If that power were a fraudulent one, and had been knowingly uttered, as such, by the undersigned in Louisiana, that would have been a wicked and a criminal act, indictable in the courts of that State; but not an official act, to be the subject of impeachment.

But the undersigned denies that the power in question was a forged or fraudulent one. That is an after-thought on the part of Simon Mussina, acting in concert with La Vega, in the purpose of endeavoring to affect injuriously the title of Mr. Lapsley. The power was a genuine one, proved as such in due form of law. And the parties in interest not only did not knowingly use or utter a fraudulent power in the case, but they never heard or suspected, or had cause to suspect,

that the power was questionable in any respect, or subject to any imputation, until after or at the trial of the case in Louisiana.

Here, again, the imputation of fraud strikes deep and wide. It does not merely affect the undersigned, but the numerous other persons in Alabama and Texas—parties, counsel, and witnesses—concerned in the production and proof of this power, including the *empresarios*, Samuel M. Williams and Stephen F. Austin: the land in dispute having passed from La Vega and been sold under this power by Williams for the benefit of Austin, the real owner, and the proceeds transmitted to him for his release from prison in Mexico. If the power was a forged one, then, who perpetrated the felony? For all these persons, including as well Stephen F. Austin and Samuel M. Williams as the other later parties to the title, and himself, the undersigned indignantly denies the charge; and he entreats every member of the House to pause, ere he entertain the suggestion of an imputation, which not only affects the property, but the honor, of so many persons among the highest and best in the country, living and dead, who have not been and cannot be heard in their vindication by the House.

The undersigned might aver, that of this power of attorney he had no knowledge whatever; but he will not do so in this relation, for, in the face of such an imputation, involving the honor of so many persons of the highest character and estimation, he disdains to plead any consideration of personal distinction.

This power of attorney, as it appears in the case, is in the form of what is denominated, in the jurisprudence of Spain and Mexico, a *testimonio*; that is, an authentic instrument of title, importing verity; that is, proving and giving faith of itself, without other proof. It is not a deed, in the sense of the common law; that is, a sealed paper, deriving authority from the seal and signature of the grantors; nor is it a copy, depending on verification by comparison with an original; but it is a duplicate original of a judicial act. In and by it, Juan Gonzales, *regidor* and alcalde in turn of the city of Leona Vicario, authenticates the fact that, on the 5th day of May, 1832, José Maria Aguirre, Tomas Vega, and Rafael Aguirre appeared before him, and declared that they constituted and appointed Samuel M. Williams their attorney, to sell and convey certain *sitios* of land, conceded to them on the 25th of March, 1825, under the colonization laws of the State.

In addition to this act is a power, executed on the 28th day of April, 1832, by the same parties, in the same form, and authenticated by the same magistrate, authorizing the same Samuel M. Williams to locate the lands in question.

All parties admit the truth of the power to locate, without which, indeed, there would be no subject-matter of controversy; and the power of sale remained unimpeached until called in question by affidavit of Spencer, at the trial of the cause in the circuit court at New Orleans; that is, twenty-five years after its date, and twenty-four years after the location of the land by Williams.

Notwithstanding this objection, the instrument, after due consideration of the court, was admitted as authentic; and this ruling was affirmed by the Supreme Court.—(Spencer *vs.* Lapsley, Howard's Rep., vol. 20, p. —.)

Its authenticity is now disputed on two grounds:

First, in a deposition, taken *ex parte*, Tomas de la Vega, after having acquiesced and lain by twenty-five years, now denies that he gave the power. On the other hand, the magistrate, Juan Gonzales, makes oath to the verity of his own signature, and the authenticity of the act. It is oath against oath; on the one hand, the magistrate; on the other, the party interested, seeking to invalidate the judicial act under which the lands passed, and thus to get back the land.

Secondly, an *ex parte* deposition of a person, purporting to be keeper of the archives, asserts that the *protocol* of the power on file is without the signature of La Vega. To which it is obvious to reply that, even if the deposition be true, still the *protocol* is no more authentic than the *testimonio*, and it is just as competent to say that the *testimonio* proves the falsity of the *protocol*.

In a word, as the *testimonio* is a title, importing verity of itself, it cannot be deprived of its authority by the mere allegation, collaterally, of discrepancy between it and the *protocol*, but remains possessed of authority, with full presumption of authenticity, until the contrary be proved on special proceedings applicable to the subject-matter.

Such, as the undersigned believes, is the rule of the laws of Spain and Mexico, pertinent to the question. And thus, notwithstanding all suggestions to the contrary, the instrument is entitled to be respected as authentic in regard of all the matters before the House. Of course, neither its existence nor its use in court can be imputed, either to the undersigned or his associates in interest, as a wrongful act.

In reference to this point, some of the questions put in the inquiry before the committee seemed to intimate that the conduct of the undersigned and his associates, in despatching an agent to Saltillo to investigate the imputations cast on this power of attorney, were obnoxious to censure. The undersigned is unable to perceive why. Believing then, and still believing, that the power of attorney is perfectly genuine and authentic; believing that the fraud is on the other side, and that Tomas de la Vega, if he in truth gave the alleged deposition, is colluding with Simon Mussina to attack their title, might not the parties interested endeavor in good faith to explore the facts, where alone they could be explored, in the State of Coahuila?

The testimony of Mr. League proves the perfect good faith with which he, in behalf of all the parties interested, endeavored to ascertain the truth, not so much for the sake of the interests at stake, as for the vindication of their honor. He pursued the regular course in such matters—that of direct application to the magistrate, Gonzales, and of such inquiry otherwise as he or his agent was permitted to make at Saltillo, with powerful interests there to obstruct the inquiry. And there was nothing in the steps taken in this respect, including the indemnity paid to Gonzales, to induce him to go to New Orleans and testify, which is not of constant occurrence in the trial of questions of admiralty and of foreign contract, and other cases of international relation.

And the undersigned most respectfully submits to the House that it cannot, in this way, and on the trial of this preliminary question

of impeachment, upset a power of attorney which has already received the sanction of the courts of law, and which, if subject to question in other cases, must be tried in those courts of law. The House cannot in this way try a question of right existing, or which may exist, between Mr. Lapsly and Simon Mussina, as the personator of Tomas de la Vega; above all, it cannot, upon any proofs before it, adjudicate that question in favor of Mussina.

In this relation the undersigned cannot forbear to allude to a most significant fact which occurred in the course of the present investigation. Mr. Potter, a lawyer in Texas of well-earned distinction, and a most intelligent witness, objected to answer certain of the questions in committee, put in behalf of Mussina, from suspicion that the real object of them was to elicite facts, or make evidence, to be used in land suits pending in the courts. There is much in the case to justify that suspicion; and the undersigned entreats that this consideration may have due weight in the deliberations of the House.

There is one other subject which, although collateral only to the charges preferred, yet occupies a large space in the evidence before the committee, to which the undersigned begs leave to refer in conclusion, namely, the case of Ufford *vs.* Dycks, tried in the district court of Texas in 1854.

In that case the plaintiff claimed under a concession and grant to Rafael Aguirre, and the land passed by deed of Samuel M. Williams, as the attorney of Aguirre, it being the power of attorney heretofore spoken of, the authority of Aguirre being given by the same act—that is, the case involved another title, of which the same paper was a documentary incident. It is not pretended that the undersigned had any interest in the case; but it is said that he ought not to have tried it, because it depended on a power of attorney in which he was interested.

He replies, first, that he entered upon the case without any knowledge or suspicion of its relation to that power. The power was never read in the case; it was not argued; no question was presented upon it for the court to consider; it went into the case by agreement of counsel; so all the counsel testify.—(Testimony, pp. 254, 698, 410.) Of course, the undersigned did not rule upon it, or do anything else regarding it. Nor, if he had, could anything which he might have said or done in the premises have had any effect, either as law or fact, on questions to be tried in the circuit court of Louisiana.

But that is of no moment. It is immaterial that a judge has interest of his own depending on a question of law which arises in a case before him. Of course he has, in most cases. He declares a rule of personal right in behalf of others, which is also his personal right; and so in questions of property. Nor is it material that he has interests affected by a particular document, unless those interests are at issue in the same case. These are questions which might once have been opened to doubt; but they are so no longer. It is now settled that nothing disqualifies, except such interest in the suit, as, in a question of evidence, would render a witness incompetent to testify. That

is the rule, as pronounced by all the judges of England in the case of Dimes *vs.* Grand Junction Canal Company, where a decree made by the vice chancellor, and enrolled by the chancellor, (Lord Cottenham,) was called in question, because of the interest of Lord Cottenham as a stockholder of the Grand Junction Canal. The successive arguments on this question before the master of the rolls, (Lord Langdale,) the chancellor himself, and the House of Lords, are a full and most instructive commentary on the subject, and completely vindicate the conduct of the undersigned in the case of Ufford *vs.* Dycks.—(See Beavan's rep., vol. 12, p. 63; Hall & Tuells' Rep., vol. 2, p. 92; House of Lords' cases, vol. 3, p. 759.)

To conclude, the undersigned begs permission to refer to one other topic, incidental to the general subject. He is informed that rumors have been circulated industriously to the effect, that the people of the State of Texas have already prejudged his case, and that they call for his impeachment. If such were the sentiment of the people of Texas, that circumstance should not, and of course would not, and could not, influence the deliberations of this House. A question of the impeachment of a judge is one to be decided on its merits. His popularity or unpopularity is a thing altogether foreign to the question. When mere popularity becomes the sole test of judicial qualification, there will cease to be any assurance of the faithful administration of justice. "Plaudits," it has been well said, "are fitter for players than magistrates;" and "a popular judge is a deformed thing." Judges are "to do good, to love the people, and give them justice;" but *nihil inde expectantes.* At the same time, the undersigned emphatically denies that the people of Texas expect or call for his impeachment; and he pronounces the assertion that it is so, if it have been asserted, a calumny on the people of Texas as well as on himself, by whomsoever, high or low, the assertion may have been made.

The legislature of Texas, many years ago, did, it is true, entertain complaints against the undersigned; and the subject of those complaints was investigated by the House of Representatives here, whose action acquitted the undersigned; and that action disposed of those particular complaints, not here only, but also in Texas. When the present new complaints arose, the legislature of Texas intimated its wish to have them duly investigated, but it did not prejudge the case; it expressly disavowed having any desire on the subject, other than for a speedy termination of the controversy, which it deemed due alike to the State and to the undersigned, and which he also earnestly desires. He offered, at an early stage of the inquiry, to show the true sentiment of the people of Texas in the premises, as he would have done, if the committee had permitted, and had not decided that it was a matter of inquiry unfit to be entertained by them, and of course improper for the consideration of the House. And the undersigned is prepared to resume his official duties, with undoubting confidence in the candor, the right feeling, and the good will of the people of Texas.

Meanwhile, he submits the whole case to the intelligence and wisdom of the House; and feeling conscious, as he does, of perfect uprightness of act and thought, and well knowing that the charges pre-

ferred against him are unjust and untrue, he must, of course, expect that the House wil so determine; but if it should be otherwise, and the House be not prepared to give him a full, complete, and free acquittal of the charges, then he desires that such course be taken in the matter as shall bring it to conclusion at the bar of the high judicature provided by the constitution for the ultimate decision of all such questions, the Senate of the United States.

JOHN C. WATROUS.

35TH CONGRESS, 1st Session. } HOUSE OF REPRESENTATIVES. { MIS. DOC. No. 137.

# APPROPRIATIONS, NEW OFFICERS, &c.

# STATEMENTS

SHOWING

I. APPROPRIATIONS MADE DURING THE FIRST SESSION OF THE THIRTY-FIFTH CONGRESS.
II. OFFICERS CREATED AND THE SALARIES THEREOF.
III. THE OFFICES THE SALARIES OF WHICH HAVE BEEN INCREASED, WITH THE AMOUNT OF SUCH INCREASE, DURING THE SAME PERIOD.

AUGUST 12, 1858.

PREPARED UNDER THE DIRECTION OF THE SECRETARY OF THE SENATE AND THE CLERK OF THE HOUSE OF REPRESENTATIVES, IN COMPLIANCE WITH THE SIXTH SECTION OF THE "ACT TO AUTHORIZE THE APPOINTMENT OF ADDITIONAL PAYMASTERS, AND FOR OTHER PURPOSES," APPROVED JULY 4, 1836.

WASHINGTON:
JAMES B. STEEDMAN, PRINTER
1858.

## STATEMENT.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| **APPROPRIATIONS MADE DURING THE FIRST SESSION OF THE THIRTY-FIFTH CONGRESS.** | | |
| *By the act to authorize the issue of treasury notes.* | | |
| To purchase said treasury notes at par for the amount of principal and interest due at the time of the purchase on such notes | Indefinite. | |
| To defray the expenses of engraving, printing, preparing, and issuing the treasury notes herein authorized | $20,000 00 | $20,000 00 |
| *By the act making appropriations for the payment of invalid and other pensions of the United States for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For invalid pensions, under various acts | 325,000 00 | |
| For pensions under acts of the eighteenth March, eighteen hundred and eighteen, fifteenth May, eighteen hundred and twenty-eight, and seventh June, eighteen hundred and thirty-two | 18,000 00 | |
| For pensions to widows of those who served in the revolutionary war, under the third section of the act of fourth July, eighteen hundred and thirty-six, the acts of seventh July, eighteen hundred and thirty-eight, third March, eighteen hundred and forty-three, seventeenth June, eighteen hundred and forty-four, second February and twenty-ninth July, eighteen hundred and forty-eight, and second section act of third February, eighteen hundred and fifty-three | 250,000 00 | |
| For pensions to widows and orphans, under act of twenty-first of July, eighteen hundred and forty-eight, first section act of third February, eighteen hundred and fifty-three, and under special acts | 86,000 00 | |
| For privateer invalids | 500 00 | |
| For navy pensions to widows and orphans, under act of eleventh August, eighteen hundred and forty-eight | 90,000 00 | 769,500 00 |
| *By the act to enable the President of the United States to fulfil the stipulations contained in the third and sixth articles of the treaty between the United States and the King of Denmark, of the eleventh April, eighteen hundred and fifty-seven, for the discontinuance of the Sound dues.* | | |
| To carry out the stipulation contained in the third article of said treaty | 393,011 00 | |
| To carry out the stipulation contained in the sixth article of said treaty, or so much thereof as may be necessary to pay the interest provided for in said article | 15,720 44 | 408,731 44 |

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| *By the act to appropriate money to supply deficiencies in the appropriations for paper, printing, binding, and engraving ordered by the Senate and House of Representatives of the thirty-third and thirty-fourth Congresses, and which has been executed.* | | |
| To pay for paper | 104,000 00 | |
| To pay for the printing ordered by the Senate and House of Representatives during the thirty-third and thirty-fourth Congresses | 57,619 94 | |
| To pay for the binding, lithographing, and engraving ordered by the Senate during the thirty-third and thirty-fourth Congresses | 179,569 64 | |
| | | 341,189 58 |
| *By the act to supply deficiencies in the appropriations for the service of the fiscal year ending the thirtieth of June, eighteen hundred and fifty-eight.* | | |
| For compensation of the officers, clerks messengers, and others receiving an annual salary, in the service of the House of Representatives, viz: Six messengers, by resolution of the House of Representatives, twenty-third December, eighteen hundred and fifty-seven | 3,913 00 | |
| For folding documents, including pay of folders, wrapping paper, twine, and paste | 20,000 00 | |
| For furniture for Speaker's room and committee rooms, clerks' offices, Sergeant-at-arms' office, Doorkeeper's room, and carpenters' work | 30,000 00 | |
| For newspapers | 3,000 00 | |
| For laborers, by resolution of the House of Representatives, twenty-third December, eighteen hundred and fifty-seven | 2,000 00 | |
| For stationery | 4,000 00 | |
| For horses, carriages, and saddle horses | 1,500 00 | |
| To enable John C. Rives to pay to the reporters of the House for reporting the debates of the present session of Congress the usual additional compensation of eight hundred dollars each | 4,000 00 | |
| ARMY. | | |
| For the regular supplies of the quartermaster's department, consisting of fuel for the officers, enlisted men, guard, hospitals, storehouses, and offices; forage in kind for the horses, mules, and oxen of the quartermasters' department at the several posts and stations, and with the armies in the field; for the horses of the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, the companies of light artillery, and such companies of infantry as may be mounted, and for the authorized number of officers' horses when serving in the field and at the outposts; of straw for soldiers' bedding, and of stationery, including company and other blank books for the army, certificates for discharged soldiers, blank forms for the pay and quartermasters' departments; and for the printing of division and department orders, army regulations, and reports | 778,000 00 | |
| Amount carried forward | 846,413 00 | 1,539,421 02 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $846,413 00 | $1,539,421 02 |
| For the purchase of horses for the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, the companies of light artillery, and such infantry as it may be found necessary to mount at the frontier posts | 252,000 00 | |
| For the incidental expenses of the quartermaster's department, consisting of postage on letters and packages received and sent by officers of the army on public service; expenses of courts-martial and courts of inquiry, including the additional compensation to judge advocates, recorders, members, and witnesses, while on that service, under the act of March sixteenth, eighteen hundred and two; extra pay to soldiers employed under the direction of the quartermaster's department, in the erection of barracks, quarters, storehouses, and hospitals, the construction of roads, and other constant labor, for periods of not less than ten days, under the acts of March second, eighteen hundred and nineteen, and August fourth, eighteen hundred and fifty-four, including those employed as clerks at division and department headquarters; expenses of expresses to and from the frontier posts and armies in the field; of escorts to paymasters, other disbursing officers, and trains, when military escorts cannot be furnished; expenses of the interment of non-commissioned officers and soldiers; authorized office furniture; hire of laborers in the quartermaster's department, including hire of interpreters, spies, and guides, for the army; compensation of clerks to officers of the quartermaster's department; compensation of forage and wagon masters, authorized by the act of July fifth, eighteen hundred and thirty-eight; for the apprehension of deserters, and the expenses incident to their pursuit; the following expenditures required for the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, and such companies of infantry as may be mounted, viz: the purchase of travelling forges, blacksmiths' and shoeing tools, horse and mule shoes and nails, iron and steel for shoeing, hire of veterinary surgeons, medicines for horses and mules, picket ropes, and shoeing the horses of those corps | 190,000 00 | |
| For constructing barracks and other buildings at posts which it may be necessary to occupy during the year; and for repairing, altering, and enlarging buildings at the established posts, including hire or commutation of quarters for officers on military duty; hire of quarters for troops, of storehouses for the safe-keeping of military stores, and of grounds for summer cantonments; for encampments and temporary frontier stations. | 80,000 00 | |
| For transportation of the army, including the baggage of the troops when moving either by land or water; of clothing, camp, and garrison equipage from the depot at Philadelphia to the several posts and army depots; horse equipments and of subsistence from the places of purchase, and from the places of delivery under contract, to such places as the circumstances of the service may require it to be sent; of ordnance, ordnance stores, and small-arms, from the foundries and armories to the arsenals, fortifications, frontier | | |

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| posts, and army depots; freights, wharfage, tolls, and ferriages; for the purchase and hire of horses, mules, and oxen, and the purchase and repair of wagons, carts, drays, ships, and other sea-going vessels and boats for the transportation of supplies and for garrison purposes; for drayage and cartage at the several posts; hire of teamsters; transportation of funds for the pay and other disbursing departments; the expense of sailing public transports on the various rivers, the Gulf of Mexico, and the Atlantic and Pacific; and for procuring water at such posts as from their situation require that it be brought from a distance; and for clearing roads and removing obstructions from roads, harbors and rivers, to the extent which may be required for the actual operations of the troops on the frontier | 5,400,000 00 | |
| For subsistence in kind | 1,220,000 00 | |
| For surveys for military defences, geographical explorations, and reconnaissances for military purposes | 5,000 00 | |
| MISCELLANEOUS. | | |
| For contingent expenses of the northeast executive building, viz: for fuel, light, and repairs | 1,000 00 | |
| For the erection of stables and conservatory at the President's house to replace those about to be taken down to make room for the extension of the Treasury building | 3,905 00 | |
| For surveying the public lands and private land claims in California, including office expenses incident to the survey of claims, and to be disbursed at the rates prescribed by law for the different kinds of work, being the amount of surveying liabilities incurred by the surveyor general during the fiscal year ending thirtieth June, eighteen hundred and fifty-seven, over and above that authorized under the appropriation of fifty thousand dollars for that period | 220,000 00 | |
| For payment to clerks temporarily employed in the Post Office Department on account of the extraordinary labors connected with the lettings of new contracts for the term commencing on the first July, eighteen hundred and fifty-eight, and the increase of business in the inspection and depredation office of said department | 5,218 89 | |
| For lighting the President's house and Capitol, the public grounds around them, and around the executive offices, and Pennsylvania avenue, and Bridge and High streets, in Georgetown | 5,000 00 | |
| For compensation of the surveyor general of Utah Territory, from first day of January, eighteen hundred and fifty-six, to thirtieth of June, eighteen hundred and fifty-seven | 1,500 00 | |
| For purchase of the "Masonic Temple," in the city of Boston, for the accommodation of the United States courts, upon the terms agreed on by the Secretary of the Interior and the proprietors thereof, in addition to the sum of one hundred thousand dollars appropriated by the act of third March, eighteen hundred and fifty-seven, for the erection of a building for said purpose | 5,000 00 | |
| To supply deficiencies in the revenue of the Post Office Department for the year ending the thirtieth of June, eighteen hundred and fifty-eight | 1,469,173 00 | |
| To enable the accounting officers of the treasury to allow credit to the clerk of the House of Representatives for such payments out of its contingent fund as have been or may be made under allowances authorized by the House of Representatives during the last Congress | Indefinite. | 9,704,209 89 |
| Amount carried forward | | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $11,243,630 91 |
| *By the act making appropriations for the current and contingent expenses of the Indian department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June thirtieth, eighteen hundred and fifty-nine.* | | |
| For the current and contingent expenses of the Indian department, viz: | | |
| For the pay of superintendents of Indian affairs, and of the several Indian agents, per acts of fifth June, eighteen hundred and fifty, twenty-eighth September, eighteen hundred and fifty, twenty-seventh February, eighteen hundred and fifty-one, third March, eighteen hundred and fifty-two, third March, eighteen hundred and fifty-three, thirty-first July, eighteen hundred and fifty-four, third March, eighteen hundred and fifty-five, eighteenth August, eighteen hundred and fifty-six, and third March, eighteen hundred and fifty-seven | $86,250 00 | |
| For the pay of the several Indian sub-agents, per act of thirty-first July, eighteen hundred and fifty-four | 10,500 00 | |
| For the pay of clerk to superintendent at St. Louis, Missouri, per act of twenty-seventh June, eighteen hundred and forty-six | 1,200 00 | |
| For the pay of clerk to superintendent in California, per act of third March, eighteen hundred and fifty-two | 2,500 00 | |
| For the pay of interpreters, per acts of thirtieth June, eighteen hundred and thirty-four, twenty-seventh February, eighteen hundred and fifty-one, and eighteenth August, eighteen hundred and fifty-six | 31,900 00 | |
| For presents to Indians | 5,000 00 | |
| For provisions for Indians | 11,800 00 | |
| For buildings at agencies, and repairs thereof | 10,000 00 | |
| For insurance, transportation, and necessary expenses of delivery of annuities, goods, and provisions to the Indian tribes in Minnesota, Michigan, and Wisconsin | 30,000 00 | |
| For contingencies of the Indian department | 36,500 00 | |
| For the employment of temporary clerks by superintendent of Indian affairs, on such occasions and for such periods of time as the Secretary of the Interior may deem necessary to the public service | 5,000 00 | |
| BLACKFOOT NATION. | | |
| For third of ten instalments as annuity, to be expended in the purchase of such goods, provisions, and other useful articles as the President, at his discretion, may from time to time determine, per ninth article of the treaty of seventeenth October, eighteen hundred and fifty-five | 20,000 00 | |

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| the discretion of the President, per tenth article of the treaty of seventeenth October, eighteen hundred and fifty-five | 15,000 00 | |
| For expenses of transportation and delivery of annuities in goods and provisions | 17,000 00 | |
| CALAPOOIAS, MOLALLA, AND CLACKAMAS INDIANS OF WILLAMETTE VALLEY. | | |
| For fourth of five instalments of annuity for beneficial objects, per second article of treaty twenty-second January, eighteen hundred and fifty-five | 10,000 00 | |
| For fourth of five instalments for pay of physician, teacher, blacksmith, and farmer, per third article treaty twenty-second January, eighteen hundred and fifty-five | 2,260 00 | |
| CHASTA, SCOTON, AND UMPQUA INDIANS. | | |
| For fourth of fifteen instalments of annuity, to be expended as directed by the President, per third article treaty eighteenth November, eighteen hundred and fifty-four | 2,000 00 | |
| For fourth of fifteen instalments for the pay of a farmer, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 600 00 | |
| For fourth of five instalments for support of two smiths and smiths' shops, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 2,120 00 | |
| For fourth of ten instalments for pay of physician, medicines, and expense of care of the sick, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 1,060 00 | |
| For fourth of fifteen instalments for pay of teachers and purchase of books and stationery, per fifth article treaty eighteenth November, eighteen hundred and fifty four | 1,200 00 | |
| For this amount to be expended when the united bands shall be required to remove to the Table Rock reserve, or elsewhere, for provisions to aid in their subsistence during the first year they shall reside thereon, as the President may direct, per fourth article treaty eighteenth November, eighteen hundred and fifty-four | 6,500 00 | |
| CHIPPEWAS OF LAKE SUPERIOR. | | |
| Fulfilling the treaty of thirtieth September, eighteen hundred and fifty-four: | | |
| For two-thirds of seventeenth of twenty-five instalments in money, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 8,333 33 | |
| Amount carried forward | 316,723 33 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $316,723 33 | $11,243,630 91 |
| For two-thirds of seventeenth of twenty-five instalments for the pay of two carpenters, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 800 00 | |
| For two-thirds of seventeenth of twenty-five instalments in goods, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 7,000 00 | |
| For two-thirds of seventeenth of twenty-five instalments for the support of schools, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 1,333 33 | |
| For two-thirds of seventeenth of twenty-five instalments for the pay of two farmers, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 666 67 | |
| For two-thirds of seventeenth of twenty-five instalments for the purchase of provisions and tobacco, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 1,333 33 | |
| For fourth of twenty instalments in coin, goods, household furniture, and cooking utensils, agricultural implements and cattle, carpenters' and other tools, and building materials, and for moral and educational purposes, per fourth article treaty thirtieth September, eighteen hundred and fifty four | 19,000 00 | |
| For fourth of five instalments in blankets, cloths, nets, guns, ammunition, and such other articles of necessity as they may require, to the Bois Forte band, per twelfth article treaty thirtieth September, eighteen hundred and fifty-four | 2,000 00 | |
| For fourth of twenty instalments for six smiths and assistants, per second and fifth articles treaty thirtieth September, eighteen hundred and fifty-four | 5,040 00 | |
| For fourth of twenty instalments for the support of six smiths' shops, per second and fifth articles treaty thirtieth September, eighteen hundred and fifty-four | 1,320 00 | |
| For second of twenty instalments for the seventh smith and assistant, and support of shop, per second and fifth articles treaty thirtieth September, eighteen hundred and fifty-four | 1,060 00 | |
| For support of a smith, assistant, and shop for the Bois Forte band, during the pleasure of the President, per twelfth article treaty thirtieth September, eighteen hundred and fifty-four | 1,060 00 | |
| For support of two farmers for the Bois Forte band, during the pleasure of the President, per twelfth article treaty thirtieth September, eighteen hundred and fifty-four | 1,200 00 | |

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| CHIPPEWAS OF THE MISSISSIPPI. | | |
| Fulfilling the treaty of twenty-second February, eighteen hundred and fifty-five: | | |
| For one-third of seventeenth of twenty-five instalments in money, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 4,166 67 | |
| For one-third of seventeenth of twenty-five instalments for the pay of two carpenters, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 400 00 | |
| For one-third of seventeenth of twenty-five instalments in goods, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 3,500 00 | |
| For one-third of seventeenth of twenty-five instalments for the support of schools, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 666 67 | |
| For one-third of seventeenth of twenty-five instalments for the purchase of provisions and tobacco, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 666 67 | |
| For one-third of seventeenth of twenty-five instalments for the support of two smiths' shops, including the pay of two smiths and assistants, and furnishing iron and steel, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 666 67 | |
| For one-third of seventeenth of twenty-five instalments for pay of two farmers, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 333 33 | |
| For fourth of twenty instalments of annuity in money, per third article treaty twenty-second February, eighteen hundred and fifty-five | 20,000 00 | |
| CHIPPEWAS, PILLAGER, AND LAKE WINNIBIGOSHISH BANDS. | | |
| For fourth of thirty instalments of annuity in money, per third article treaty twenty-second February, eighteen hundred and fifty-five | 10,666 66 | |
| For fourth of thirty instalments of annuity in goods, per third article treaty twenty-second February, eighteen hundred and fifty-five | 8,000 00 | |
| For fourth of thirty instalments for purposes of utility, per third article treaty twenty second February, eighteen hundred and fifty-five | 4,000 00 | |
| Amount carried forward | 411,603 33 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $11,243,630 91 |
| *By the act making appropriations for the current and contingent expenses of the Indian department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June thirtieth, eighteen hundred and fifty-nine.* | | |
| For the current and contingent expenses of the Indian department, viz: | | |
| For the pay of superintendents of Indian affairs, and of the several Indian agents, per acts of fifth June, eighteen hundred and fifty, twenty-eighth September, eighteen hundred and fifty, twenty-seventh February, eighteen hundred and fifty-one, third March, eighteen hundred and fifty-two, third March, eighteen hundred and fifty-three, thirty-first July, eighteen hundred and fifty-four, third March, eighteen hundred and fifty-five, eighteenth August, eighteen hundred and fifty-six, and third March, eighteen hundred and fifty-seven | $86,250 00 | |
| For the pay of the several Indian sub-agents, per act of thirty-first July, eighteen hundred and fifty-four | 10,500 00 | |
| For the pay of clerk to superintendent at St. Louis, Missouri, per act of twenty-seventh June, eighteen hundred and forty-six | 1,200 00 | |
| For the pay of clerk to superintendent in California, per act of third March, eighteen hundred and fifty-two | 2,500 00 | |
| For the pay of interpreters, per acts of thirtieth June, eighteen hundred and thirty-four, twenty-seventh February, eighteen hundred and fifty-one, and eighteenth August, eighteen hundred and fifty-six | 31,900 00 | |
| For presents to Indians | 5,000 00 | |
| For provisions for Indians | 11,800 00 | |
| For buildings at agencies, and repairs thereof | 10,000 00 | |
| For insurance, transportation, and necessary expenses of delivery of annuities, goods, and provisions to the Indian tribes in Minnesota, Michigan, and Wisconsin | 30,000 00 | |
| For contingencies of the Indian department | 36,500 00 | |
| For the employment of temporary clerks by superintendent of Indian affairs, on such occasions and for such periods of time as the Secretary of the Interior may deem necessary to the public service | 5,000 00 | |
| BLACKFOOT NATION. | | |
| For third of ten instalments as annuity, to be expended in the purchase of such goods, provisions, and other useful articles as the President, at his discretion, may from time to time determine, per ninth article of the treaty of seventeenth October, eighteen hundred and fifty-five | 20,000 00 | |

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| For third of ten instalments as annuity, to be expended in establishing and instructing them in agricultural and mechanical pursuits, and in educating their children, and promoting civilization and Christianity, at the discretion of the President, per tenth article of the treaty of seventeenth October, eighteen hundred and fifty-five | 15,000 00 | |
| For expenses of transportation and delivery of annuities in goods and provisions | 17,000 00 | |
| CALAPOOIAS, MOLALLA, AND CLACKAMAS INDIANS OF WILLAMETTE VALLEY. | | |
| For fourth of five instalments of annuity for beneficial objects, per second article of treaty twenty-second January, eighteen hundred and fifty-five | 10,000 00 | |
| For fourth of five instalments for pay of physician, teacher, blacksmith, and farmer, per third article treaty twenty-second January, eighteen hundred and fifty-five | 2,260 00 | |
| CHASTA, SCOTON, AND UMPQUA INDIANS. | | |
| For fourth of fifteen instalments of annuity, to be expended as directed by the President, per third article treaty eighteenth November, eighteen hundred and fifty-four | 2,000 00 | |
| For fourth of fifteen instalments for the pay of a farmer, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 600 00 | |
| For fourth of five instalments for support of two smiths and smiths' shops, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 2,120 00 | |
| For fourth of ten instalments for pay of physician, medicines, and expense of care of the sick, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 1,060 00 | |
| For fourth of fifteen instalments for pay of teachers and purchase of books and stationery, per fifth article treaty eighteenth November, eighteen hundred and fifty four | 1,200 00 | |
| For this amount to be expended when the united bands shall be required to remove to the Table Rock reserve, or elsewhere, for provisions to aid in their subsistence during the first year they shall reside thereon, as the President may direct, per fourth article treaty eighteenth November, eighteen hundred and fifty-four | 6,500 00 | |
| CHIPPEWAS OF LAKE SUPERIOR. | | |
| Fulfilling the treaty of thirtieth September, eighteen hundred and fifty-four: | | |
| For two-thirds of seventeenth of twenty-five instalments in money, per fourth article treaty fourth October, eighteen hundred and forty-two, and eighth article treaty thirtieth September, eighteen hundred and fifty-four | 8,333 33 | |
| Amount carried forward | 316,723 33 | 11,243,630 91 |

STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $530,923 33 | $11,243,630 91 |
| For permanent provision for iron and steel for shop, per eighth article treaty twenty-fourth January, eighteen hundred and twenty-six, and fifth article treaty seventh August, eighteen hundred and fifty-six | 270 00 | |
| For permanent provision for the pay of a wheelwright, per eighth article treaty twenty-fourth January, eighteen hundred and twenty-six, and fifth article treaty seventh August, eighteen hundred and fifty-six | 600 00 | |
| For blacksmith and assistant and shop and tools during the pleasure of the President, per fifth article treaty fourteenth February, eighteen hundred and thirty-three, and fifth article treaty seventh August, eighteen hundred and fifty-six | 840 00 | |
| For iron and steel for shop during the pleasure of the President, per fifth article treaty fourteenth February, eighteen hundred and thirty-three, and fifth article treaty seventh August, eighteen hundred and fifty-six | 270 00 | |
| For wagon-maker during the pleasure of the President, per fifth article treaty fourteenth February, eighteen hundred and thirty-three, and fifth article treaty seventh August, eighteen hundred and fifty-six | 600 00 | |
| For assistance in agricultural operations during the pleasure of the President, per eighth article treaty twenty-fourth January, eighteen hundred and twenty-six, and fifth article treaty seventh August, eighteen hundred and fifty-six | 2,000 00 | |
| For education during the pleasure of the President, per fifth article treaty fourteenth February, eighteen hundred and thirty-three, and fifth article treaty seventh August, eighteen hundred and fifty-six | 1,000 00 | |
| For the second of seven additional instalments for two blacksmiths, assistants, shop, and tools, per thirteenth article treaty twenty-fourth March, eighteen hundred and thirty-two, and fifth article treaty seventh August, eighteen hundred and fifty-six | 1,680 00 | |
| For the second of seven additional instalments for iron and steel for shops, per thirteenth article treaty twenty-fourth March, eighteen hundred and thirty-two, and fifth article treaty seventh August, eighteen hundred and fifty-six | 540 00 | |
| For twenty-eighth of thirty-three instalments for education, per fourth article treaty fourth January, eighteen hundred and forty-five, and fifth article treaty seventh August, eighteen hundred and fifty-six | 3,000 00 | |
| For fifteenth of twenty instalments for education, per fourth article treaty fourth January, eighteen hundred and forty-five, and fifth article treaty seventh August, eighteen hundred and fifty-six | 3,000 00 | |
| For five per centum interest on two hundred thousand dollars, for purposes of education, per sixth article treaty seventh August, eighteen hundred and fifty-six | 10,000 00 | |

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|---|---|---|
| For life annuity to chief, per private article to supplemental treaty twenty-fourth September, eighteen hundred and twenty-nine, to treaty of third October, eighteen hundred and eighteen | 100 00 | |
| For interest on forty-six thousand and eighty dollars, at five per centum, being the value of thirty-six sections of land set apart by treaty of eighteen hundred and twenty-nine for education, per resolution of Senate nineteenth January, eighteen hundred and thirty-eight, and fifth article treaty sixth May, eighteen hundred and fifty-four | 2,304 00 | |
| For fifth of eight equal instalments for payment of five chiefs, per sixth article treaty sixth May, eighteen hundred and fifty-four | 1,250 00 | |
| FLORIDA INDIANS, OR SEMINOLES. | | |
| For the last of fifteen instalments in goods, per sixth article treaty fourth January, eighteen hundred and forty-five | 2,000 00 | |
| For the last of fifteen instalments in money, per sixth article treaty fourth January, eighteen hundred and forty-five, and fourth article treaty ninth May, eighteen hundred and thirty-two | 3,000 00 | |
| IOWAS. | | |
| For interest in lieu of investment on fifty-seven thousand five hundred dollars to the first July, eighteen hundred and fifty-nine, at five per centum, for education or other beneficial purposes, under the direction of the President, per second article treaty nineteenth October, eighteen hundred and thirty-eight, and ninth article treaty seventeenth May, eighteen hundred and fifty-four | 2,875 00 | |
| KANSAS. | | |
| For interest in lieu of investment on two hundred thousand dollars, at five per centum, per second article treaty fourteenth January, eighteen hundred and forty-six | 10,000 00 | |
| KASKASKIAS, PEORIAS, WEAS, AND PIANKESHAWS. | | |
| For second of three instalments of nine thousand dollars for the years eighteen hundred and fifty-seven, eighteen hundred and fifty-eight, and eighteen hundred and fifty-nine, per sixth article treaty thirtieth May, eighteen hundred and fifty-four | 9,000 00 | |
| For the last of five instalments for support of blacksmith and assistant, per sixth article treaty thirtieth May, eighteen hundred and fifty-four | 720 00 | |
| Amount carried forward | 585,972 33 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $411,603 33 | $11,243,630 91 |
| For fourth of twenty instalments for purposes of education, per third article treaty twenty-second February, eighteen hundred and fifty-five | 3,000 00 | |
| For fourth of five annual instalments for the purchase of powder, shot, lead, twine, and tobacco, per third article treaty twenty-second February, eighteen hundred and fifty-five | 600 00 | |
| For fourth of five annual instalments for the hire of six laborers, per third article treaty twenty-second February, eighteen hundred and fifty-five | 3,000 00 | |
| For fourth of fifteen annual instalments for support of two smiths and smiths' shops, per third article treaty twenty-second February, eighteen hundred and fifty-five | 2,120 00 | |
| CHIPPEWAS OF SAGINAW, SWAN CREEK, AND BLACK RIVER. | | |
| For third of five equal annual instalments for educational purposes, under the direction of the President, per second article of the treaty of second August, eighteen hundred and fifty-five | 4,000 00 | |
| For third of five equal annual instalments for agricultural implements and carpenters' tools, household furniture and building materials, cattle, labor, and necessary useful articles, per second article of the treaty of second August, eighteen hundred and fifty-five | 5,000 00 | |
| For third of ten equal annual instalments in coin, to be distributed per capita, in the usual manner of paying annuities, per second article of the treaty of second August, eighteen hundred and fifty-five | 10,000 00 | |
| For third instalment for the support of one blacksmith shop for ten years, per second article of the treaty of second August, eighteen hundred and fifty-five | 1,240 00 | |
| CHIPPEWAS, MENOMONEES, WINNEBAGOES, AND NEW YORK INDIANS. | | |
| For education during the pleasure of Congress, per fifth article treaty eleventh August, eighteen hundred and twenty-seven | 1,500 00 | |
| CHICKASAWS. | | |
| For permanent annuity in goods, per act of twenty-fifth February, seventeen hundred and ninety-nine | 3,000 00 | |

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|---|---|---|
| For fifth of six equal annual instalments to Miamies residing on ceded lands, for purchase of former perpetual and other annuities and relinquishment of claims, per fourth article treaty fifth June, eighteen hundred and fifty-four | 31,739 11 | |
| MIAMIES OF INDIANA. | | |
| For their proportion of eighteenth of twenty instalments in money, per second article treaty twenty-eighth November, eighteen hundred and forty, and fourth article treaty fifth June, eighteen hundred and fifty-four | 6,863 64 | |
| For interest on investment of two hundred and twenty-one thousand two hundred and fifty-seven dollars and eighty-six cents, at five per centum, for Miami Indians of Indiana, per Senate's amendment to fourth article treaty fifth June, eighteen hundred and fifty-four | 11,062 89 | |
| MIAMIES, EEL RIVER. | | |
| For permanent annuity in goods or otherwise, per fourth article treaty third August, seventeen hundred and ninety-five | 500 00 | |
| For permanent annuity in goods or otherwise, per third article treaty twenty-first August, eighteen hundred and five | 250 00 | |
| For permanent annuity in goods or otherwise, per third and separate article to treaty thirtieth September, eighteen hundred and nine | 350 00 | |
| NAVAJOES. | | |
| For fulfilling treaty stipulations with the Navajoes, pursuant to the requirements of the tenth article treaty ninth September, eighteen hundred and forty-nine | 5,000 00 | |
| NISQUALLY, PUYALLUP, AND OTHER TRIBES AND BANDS OF INDIANS. | | |
| For fulfilling the articles negotiated twenty-sixth December, eighteen hundred and fifty-four, with certain bands of Indians of Puget's Sound, Washington Territory | ---------- | |
| For fourth instalment, in part payment for relinquishment of title to lands to be applied to beneficial objects, per fourth article treaty twenty-sixth December, eighteen hundred and fifty-four | 2,000 00 | |
| For fourth of twenty instalments for pay of instructor, smith, physician, carpenter, farmer, and assistant if necessary, per tenth article treaty twenty-sixth December, eighteen hundred and fifty-four | 4,500 00 | |
| Amount carried forward | 698,050 99 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $698,050 99 | $11,243,630 91 |
| OMAHAS | | |
| For the first of ten instalments of this amount, being second of the series, in money or otherwise, per fourth article treaty sixteenth March, eighteen hundred and fifty-four | 30,000 00 | |
| For fourth of ten instalments for support of a miller, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 600 00 | |
| For fourth of ten instalments for support of blacksmith and assistant, and iron and steel for shop, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 940 00 | |
| For fourth of ten instalments for support of farmer, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 600 00 | |
| OSAGES. | | |
| For interest on sixty-nine thousand one hundred and twenty dollars, at five per centum, being the value of fifty-four sections of land set apart second June, eighteen hundred and twenty-five, for educational purposes, per Senate resolution nineteenth January, eighteen hundred and thirty-eight | 3,456 00 | |
| OTTOES AND MISSOURIAS. | | |
| For the first of ten instalments of this amount, being the second series, in money or otherwise, per fourth article treaty fifteenth March, eighteen hundred and fifty-four | 13,000 00 | |
| For fourth of ten instalments for pay of miller, per seventh article treaty fifteenth March, eighteen hundred and fifty-four | 600 00 | |
| For fourth of ten instalments for blacksmith and assistant, and iron and steel for shop, per seventh article | 940 00 | |

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|---|---|---|
| DELAWARES. | | |
| For life annuity to chief, per private article to supplemental treaty twenty-fourth September, eighteen hundred and twenty-nine, to treaty of third October, eighteen hundred and eighteen | 100 00 | |
| For interest on forty-six thousand and eighty dollars, at five per centum, being the value of thirty-six sections of land set apart by treaty of eighteen hundred and twenty-nine for education, per resolution of Senate nineteenth January, eighteen hundred and thirty-eight, and fifth article treaty sixth May, eighteen hundred and fifty-four | 2,304 00 | |
| For fifth of eight equal instalments for payment of five chiefs, per sixth article treaty sixth May, eighteen hundred and fifty-four | 1,250 00 | |
| FLORIDA INDIANS, OR SEMINOLES. | | |
| For the last of fifteen instalments in goods, per sixth article treaty fourth January, eighteen hundred and forty-five | 2,000 00 | |
| For the last of fifteen instalments in money, per sixth article treaty fourth January, eighteen hundred and forty-five, and fourth article treaty ninth May, eighteen hundred and thirty-two | 3,000 00 | |
| IOWAS. | | |
| For interest in lieu of investment on fifty-seven thousand five hundred dollars to the first July, eighteen hundred and fifty-nine, at five per centum, for education or other beneficial purposes, under the direction of the President, per second article treaty nineteenth October, eighteen hundred and thirty-eight, and ninth article treaty seventeenth May, eighteen hundred and fifty-four | 2,875 00 | |
| KANSAS. | | |
| For interest in lieu of investment on two hundred thousand dollars, at five per centum, per second article treaty fourteenth January, eighteen hundred and forty-six | 10,000 00 | |
| KASKASKIAS, PEORIAS, WEAS, AND PIANKESHAWS. | | |
| For second of three instalments of nine thousand dollars for the years eighteen hundred and fifty-seven, eighteen hundred and fifty-eight, and eighteen hundred and fifty-nine, per sixth article treaty thirtieth May, eighteen hundred and fifty-four | 9,000 00 | |
| For the last of five instalments for support of blacksmith and assistant, per sixth article treaty thirtieth May, eighteen hundred and fifty-four | 720 00 | |
| Amount carried forward | 585,972 33 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $585,972 33 | $11,243,630 91 |
| For the last of five instalments for purchase of iron and steel, per sixth article treaty thirtieth May, eighteen hundred and fifty-four | 220 00 | |
| KICKAPOOS. | | |
| For fifth instalment of interest, at five per centum, on one hundred thousand dollars for education, per second article treaty eighteenth May, eighteen hundred and fifty-four | 5,000 00 | |
| For the payment of this sum as the fifth instalment upon two hundred thousand dollars, to be paid in eighteen hundred and fifty-eight, per second article treaty eighteenth May, eighteen hundred and fifty-four | 14,000 00 | |
| MENOMONEES. | | |
| For third of twelve instalments for continuing and keeping up a blacksmith shop, and providing the usual quantity of iron and steel, per fourth article treaty eighteenth October, eighteen hundred and forty-eight, and third article treaty twelfth May, eighteen hundred and fifty-four | 916 66 | |
| For third of ten instalments of annuity upon two hundred thousand dollars, balance of three hundred and fifty thousand dollars for cession of lands, per fourth article treaty eighteenth October, eighteen hundred and forty-eight, and third article treaty twelfth May, eighteen hundred and fifty-four | 20,000 00 | |
| MIAMIES OF KANSAS. | | |
| For permanent provision for blacksmith and assistant, and iron and steel for shop, per fifth article treaty sixth October, eighteen hundred and eighteen, and fourth article treaty fifth June, eighteen hundred and fifty-four | 940 00 | |
| For permanent provision for miller, in lieu of gunsmith, per fifth article treaty sixth October, eighteen hundred and eighteen, fifth article treaty twenty-third October, eighteen hundred and thirty-four, and fourth article treaty fifth June, eighteen hundred and fifty-four | 600 00 | |
| For their proportion of eighteenth of twenty instalments in money, per second article treaty twenty-eighth November, eighteen hundred and forty, and fourth article treaty fifth June, eighteen hundred and fifty-four | 5,636 36 | |
| For interest on fifty thousand dollars, at five per centum, for educational purposes, per third article treaty fifth June, eighteen hundred and fifty-four | 2,500 00 | |

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|---|---|---|
| ROGUE RIVERS. | | |
| For fifth of sixteen instalments in blankets, clothing, farming utensils, and stock, per third article treaty tenth September, eighteen hundred and fifty-three | 2,500 00 | |
| SACS AND FOXES OF MISSISSIPPI. | | |
| For permanent annuity in goods or otherwise, per third article treaty third November, eighteen hundred and four | 1,000 00 | |
| For twenty-seventh of thirty instalments as annuity in specie, per third article treaty twenty-first September, eighteen hundred and thirty-two | 20,000 00 | |
| For twenty-seventh of thirty instalments for gunsmith, per fourth article treaty twenty-first September, eighteen hundred and thirty-two | 600 00 | |
| For twenty-seventh of thirty instalments for iron and steel for shop, per fourth article treaty twenty-first September, eighteen hundred and thirty-two | 220 00 | |
| For twenty-seventh of thirty instalments for blacksmith and assistant, shop and tools, per fourth article treaty twenty-first September, eighteen hundred and thirty-two | 840 00 | |
| For twenty-seventh of thirty instalments for iron and steel for shop, per fourth article treaty twenty-first September, eighteen hundred and thirty-two | 220 00 | |
| For twenty-seventh of thirty instalments for forty barrels of salt and forty kegs of tobacco, per fourth article treaty twenty-first September, eighteen hundred and thirty-two | 1,000 00 | |
| For interest on two hundred thousand dollars, at five per centum, per second article treaty twenty-first October, eighteen hundred and thirty-seven | 10,000 00 | |
| For interest on eight hundred thousand dollars, at five per centum, per second article treaty eleventh October, eighteen hundred and forty-two | 40,000 00 | |
| SACS AND FOXES OF MISSOURI. | | |
| For interest on one hundred and fifty-seven thousand four hundred dollars, at five per centum, under the direction of the President, per second article treaty twenty-first October, eighteen hundred and thirty-seven | 7,870 00 | |
| SEMINOLES. | | |
| For the second of ten instalments for the support of schools, per eighth article treaty seventh August, eighteen hundred and fifty-six | 3,000 00 | |
| For the second of ten instalments for agricultural assistance, per eighth article treaty seventh August, eighteen hundred and fifty-six | 2,000 00 | |
| Amount carried forward | 959,836 99 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $698,050 99 | $11,243,630 91 |
| OMAHAS. | | |
| For the first of ten instalments of this amount, being second of the series, in money or otherwise, per fourth article treaty sixteenth March, eighteen hundred and fifty-four | 30,000 00 | |
| For fourth of ten instalments for support of a miller, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 600 00 | |
| For fourth of ten instalments for support of blacksmith and assistant, and iron and steel for shop, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 940 00 | |
| For fourth of ten instalments for support of farmer, per eighth article treaty sixteenth March, eighteen hundred and fifty-four | 600 00 | |
| OSAGES. | | |
| For interest on sixty-nine thousand one hundred and twenty dollars, at five per centum, being the value of fifty-four sections of land set apart second June, eighteen hundred and twenty-five, for educational purposes, per Senate resolution nineteenth January, eighteen hundred and thirty-eight | 3,456 00 | |
| OTTOES AND MISSOURIAS. | | |
| For the first of ten instalments of this amount, being the second series, in money or otherwise, per fourth article treaty fifteenth March, eighteen hundred and fifty-four | 13,000 00 | |
| For fourth of ten instalments for pay of miller, per seventh article treaty fifteenth March, eighteen hundred and fifty-four | 600 00 | |
| For fourth of ten instalments for blacksmith and assistant, and iron and steel for shop, per seventh article treaty fifteenth March, eighteen hundred and fifty-four | 940 00 | |
| For fourth of ten instalments for farmer, per seventh article treaty fifteenth March, eighteen hundred and fifty-four | 600 00 | |

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|---|---|---|
| **SHAWNEES.** | | |
| For permanent annuity for educational purposes, per fourth article treaty third August, seventeen hundred and ninety-five, and third article treaty tenth May, eighteen hundred and fifty-four | 1,000 00 | |
| For fifth of seven annual instalments of money, in payment for lands, per third article treaty tenth May, eighteen hundred and fifty-four | 1,000 00 | |
| For fifth instalment of interest, at five per centum, on forty thousand dollars for education, per third article treaty tenth May, eighteen hundred and fifty-four | 2,000 00 | |
| For permanent annuity for educational purposes, per fourth article treaty twenty-ninth September, eighteen hundred and seventeen, and third article treaty tenth May, eighteen hundred and fifty-four | 2,000 00 | |
| **SIX NATIONS OF NEW YORK.** | | |
| For permanent annuity in clothing and other useful articles, per sixth article treaty eleventh November, seventeen hundred and ninety-four | 4,500 00 | |
| **SIOUX OF MISSISSIPPI.** | | |
| For interest on three hundred thousand dollars, at five per centum, per second article treaty twenty-ninth September, eighteen hundred and thirty-seven | 15,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one million three hundred and sixty thousand dollars, per fourth article treaty twenty-third July, eighteen hundred and fifty-one | 68,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one hundred and twelve thousand dollars, being the amount in lieu of the reservations set apart in the third article of Senate's amendment of twenty-third June, eighteen hundred and fifty-two, to treaty twenty-third July, eighteen hundred and fifty-one | 5,600 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one million one hundred and sixty thousand dollars, per fourth article treaty fifth August, eighteen hundred and fifty-one | 58,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on sixty-nine thousand dollars, being the amount allowed in lieu of the reservation of lands set apart by the third article of Senate's amendment of twenty-third June, eighteen hundred and fifty-two, to treaty fifth August, eighteen hundred and fifty-one | 3,450 00 | |
| **TREATY OF FORT LARAMIE.** | | |
| For eighth of ten instalments in provisions and merchandise, for payment of annuities and transportation of the same to certain tribes of Indians, per seventh article treaty seventeenth September, eighteen hundred and fifty-one, and Senate's amendment thereto | 70,000 00 | |
| Amount carried forward | 1,221,709 49 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $808,426 99 | $11,243,630 91 |
| For permanent annuity, in silver, per third article treaty second October, eighteen hundred and eighteen | 2,500 00 | |
| For permanent annuity, in money, per second article treaty twentieth September, eighteen hundred and twenty-eight | 2,000 00 | |
| For permanent annuity, in specie, per second article treaty twenty-ninth July, eighteen hundred and twenty-nine | 16,000 00 | |
| For life annuity to chief, per third article treaty twentieth October, eighteen hundred and thirty-two | 200 00 | |
| For life annuity to chiefs, per third article treaty twenty-sixth September, eighteen hundred and thirty-three | 700 00 | |
| For education, during the pleasure of Congress, per third article treaty sixteenth October, eighteen hundred and twenty-six; second article treaty twentieth September, eighteen hundred and twenty-eight; and fourth article treaty twenty-seventh October, eighteen hundred and thirty-two | 5,000 00 | |
| For permanent provision for the payment of money, in lieu of tobacco, iron, and steel, per second article treaty twentieth September, eighteen hundred and twenty-eight, and tenth article of the treaty of the fifth and seventeenth June, eighteen hundred and forty-six | 300 00 | |
| For permanent provision for fifty barrels of salt, per second article of treaty twenty-ninth July, eighteen hundred and twenty-nine | 250 00 | |
| For interest on six hundred and forty-three thousand dollars, at five per centum, per seventh article of the treaty of the fifth and seventeenth June, eighteen hundred and forty-six | 32,150 00 | |
| POTTAWATOMIES OF HURON. | | |
| For permanent annuity, in money or otherwise, per second article treaty seventeenth November, eighteen hundred and seven | 400 00 | |
| QUAPAWS. | | |
| For education, during the pleasure of the President, per third article treaty thirteenth May, eighteen hundred and thirty-three | 1,000 00 | |
| For blacksmith and assistant, shop and tools, and iron and steel for shop, during the pleasure of the President, per third article treaty thirteenth May, eighteen hundred and thirty-three | 1,060 00 | |
| For farmer, during the pleasure of the President, per third article treaty thirteenth May, eighteen hundred and thirty-three | 600 00 | |

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|---|---|---|
| For the last of thirty instalments for fifty barrels of salt, per second article treaty first August, eighteen hundred and twenty-nine | 250 00 | |
| For the last of thirty instalments for three thousand pounds of tobacco, per second article treaty first August, eighteen hundred and twenty-nine | 600 00 | |
| For the last of twenty-seven instalments for one thousand five hundred pounds of tobacco, per fifth article, treaty fifteenth September, eighteen hundred and thirty-two | 300 00 | |
| For the last of thirty instalments for three smiths and assistants, per third article treaty first August, eighteen hundred and twenty-nine | 2,160 00 | |
| For the last of thirty instalments for iron and steel for shop, per third article treaty first August, eighteen hundred and twenty-nine | 660 00 | |
| For the last of thirty instalments for laborer and oxen, per third article treaty first August, eighteen hundred and twenty-nine | 365 00 | |
| For the last of twenty-seven instalments for education, per fourth article treaty fifteenth September, eighteen hundred and thirty-two | 3,000 00 | |
| For the last of twenty-seven instalments for six agriculturists, purchase of oxen, ploughs, and other implements, per fifth article treaty fifteenth September, eighteen hundred and thirty-two | 2,500 00 | |
| For the last of twenty-seven instalments for the pay of two physicians, per fifth article treaty fifteenth September, eighteen hundred and thirty-two | 400 00 | |
| For interest on one million one hundred thousand dollars, at five per centum, per fourth article treaty first November, eighteen hundred and thirty-seven | 55,000 00 | |
| For twelfth of thirty instalments of interest on eighty-five thousand dollars, at five per centum, per fourth article treaty thirteenth October, eighteen hundred and forty-six | 4,250 00 | |
| MISCELLANEOUS. | | |
| For carrying into effect the act of third March, eighteen hundred and nineteen, making provisions for the civilization of the Indian tribes, in addition to the sum specified in said act | 5,000 00 | |
| For continuing the compilation and completion of a map of the Indian Territory | 2,000 00 | |
| | | 1,338,104 49 |
| *By the act making appropriations for the support of the Military Academy for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For pay of officers, instructors, cadets, and musicians | 112,806 00 | |
| For commutation of subsistence | 3,066 00 | |
| For forage of officers' horses | 864 00 | |
| For current and ordinary expenses, as follows: repairs and improvements, fuel and apparatus, forage, postage, stationery, transportation, printing, clerks, miscellaneous and incidental expenses, and departments of instruction | 35,610 00 | |
| Amount carried forward | 152,346 00 | 12,581,735 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $152,846 00 | $12,581,735 40 |
| For gradual increase and expense of library | 1,000 00 | |
| For expenses of the board of visitors | 3,000 00 | |
| For forage for artillery and cavalry horses | 8,640 00 | |
| For supplying horses for cavalry and artillery practice | 1,000 00 | |
| For barracks for dragoon detachment | 1,500 00 | |
| For barracks for artillery detachment | 6,500 00 | |
| For purchase of a bell, and mounting the same with the clock on one of the public buildings | 450 00 | |
| For repairs to officers' quarters | 500 00 | |
| For models for the department of cavalry | 250 00 | |
| For extension of water pipes and increase of reservoir | 2,500 00 | |
| For targets and batteries for artillery exercise | 150 00 | |
| For gas pipes and retorts, extension to cadets' mess-hall, academic hall, and other public buildings | 2,500 00 | |
| For stables for dragoon and artillery horses | 2,468 00 | |
| | | 182,804 00 |
| *By the act to amend the "Act to incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," approved February sixteenth, eighteen hundred and fifty-seven.* | | |
| For the payment of salaries and incidental expenses of said institution | | 3,000 00 |
| *By the act making appropriations for the legislative, executive, and judicial expenses of government for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| LEGISLATIVE. | | |
| For compensation and mileage of senators | 162,750 00 | |
| For compensation of the officers, clerks, messengers, and others receiving an annual salary in the service of the Senate, viz: | | |
| Secretary of the Senate | 3,600 00 | |
| Officer charged with disbursements of the Senate | 480 00 | |
| Chief clerk | 2,500 00 | |

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|---|---|---|
| **SHAWNEES.** | | |
| For permanent annuity for educational purposes, per fourth article treaty third August, seventeen hundred and ninety-five, and third article treaty tenth May, eighteen hundred and fifty-four | 1,000 00 | |
| For fifth of seven annual instalments of money, in payment for lands, per third article treaty tenth May, eighteen hundred and fifty-four | 1,000 00 | |
| For fifth instalment of interest, at five per centum, on forty thousand dollars for education, per third article treaty tenth May, eighteen hundred and fifty-four | 2,000 00 | |
| For permanent annuity for educational purposes, per fourth article treaty twenty-ninth September, eighteen hundred and seventeen, and third article treaty tenth May, eighteen hundred and fifty-four | 2,000 00 | |
| **SIX NATIONS OF NEW YORK.** | | |
| For permanent annuity in clothing and other useful articles, per sixth article treaty eleventh November, seventeen hundred and ninety-four | 4,500 00 | |
| **SIOUX OF MISSISSIPPI.** | | |
| For interest on three hundred thousand dollars, at five per centum, per second article treaty twenty-ninth September, eighteen hundred and thirty-seven | 15,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one million three hundred and sixty thousand dollars, per fourth article treaty twenty-third July, eighteen hundred and fifty-one | 68,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one hundred and twelve thousand dollars, being the amount in lieu of the reservations set apart in the third article of Senate's amendment of twenty-third June, eighteen hundred and fifty-two, to treaty twenty-third July, eighteen hundred and fifty-one | 5,600 00 | |
| For eighth of fifty instalments of interest, at five per centum, on one million one hundred and sixty thousand dollars, per fourth article treaty fifth August, eighteen hundred and fifty-one | 58,000 00 | |
| For eighth of fifty instalments of interest, at five per centum, on sixty-nine thousand dollars, being the amount allowed in lieu of the reservation of lands set apart by the third article of Senate's amendment of twenty-third June, eighteen hundred and fifty-two, to treaty fifth August, eighteen hundred and fifty-one | 3,450 00 | |
| **TREATY OF FORT LARAMIE.** | | |
| For eighth of ten instalments in provisions and merchandise, for payment of annuities and transportation of the same to certain tribes of Indians, per seventh article treaty seventeenth September, eighteen hundred and fifty-one, and Senate's amendment thereto | 70,000 00 | |
| Amount carried forward | 1,221,709 49 | 11,243,630 91 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $1,221,709 49 | $11,243,630 91 |
| UMPQUAS, (COW CREEK BAND.) | | |
| For fifth of twenty instalments in blankets, clothing, provisions, and stock, per third article treaty nineteenth September, eighteen hundred and fifty-three | 550 00 | |
| Fulfilling the articles of twenty-ninth November, eighteen hundred and fifty-four, with the— | | |
| UMPQUAS AND CALAPOOIAS, OF UMPQUA VALLEY, OREGON. | | |
| For fourth of five instalments of annuity for beneficial objects, to be expended as directed by the President, per third article of treaty twenty-ninth November, eighteen hundred and fifty-four | 3,000 00 | |
| For fourth of ten instalments, for the pay of a blacksmith, and furnishing shop, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 1,060 00 | |
| For fourth of fifteen instalments for the pay of a physician and purchase of medicines, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 1,000 00 | |
| For the fourth of ten instalments for the pay of a farmer, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 600 00 | |
| For fourth of twenty instalments for the pay of a teacher and purchase of books and stationery, per sixth article treaty twenty-ninth November, eighteen hundred and fifty four | 700 00 | |
| UTAHS. | | |
| For fulfilling treaty stipulations with the Utahs, pursuant to the requirements of eighth article treaty thirtieth December, eighteen hundred and forty-nine | 5,000 00 | |
| WINNEBAGOES. | | |
| For the last of thirty instalments as annuity in specie, per second article treaty first August, eighteen hundred and twenty-nine | 18,000 00 | |
| For the last of twenty-seven instalments as annuity in specie, per third article treaty fifteenth September, eighteen hundred and thirty-two | 10,000 00 | |

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|---|---|---|
| For contingent expenses of the House of Representatives, viz: | | |
| For binding documents | 100,000 00 | |
| For furniture, repairs, and boxes for members | 10,000 00 | |
| For stationery | 15,000 00 | |
| For horses, carriages, and saddle horses | 6,000 00 | |
| For fuel, oil, and candles | 3,600 00 | |
| For newspapers | 12,500 00 | |
| For engraving, electrotyping, and lithographing | 100,000 00 | |
| For Capitol police | 5,890 00 | |
| For laborers | 6,285 00 | |
| For pages and temporary mail boys | 4,200 00 | |
| For folding documents, including pay of folders, wrapping paper, twine, and paste | 30,000 00 | |
| For cartage | 2,000 00 | |
| For miscellaneous items | 30,000 00 | |
| For twenty-four copies of the Congressional Globe and Appendix for each member and delegate of the second session of the thirty-fifth Congress | 17,352 00 | |
| For binding twenty-four copies of the Congressional Globe and Appendix for each member and delegate of the second session of the thirty-fifth Congress | 8,097 60 | |
| For reporting the debates of the second session of the thirty-fifth Congress | 8,000 00 | |
| For the usual additional compensation to the reporters for the Congressional Globe for reporting the proceedings of the House of Representatives for the next regular session of the thirty-fifth Congress, eight hundred dollars to each reporter | 4,000 00 | |
| To pay to the reporters of the Senate the usual extra compensation for the third session of the thirty-fourth Congress, eight hundred dollars each | 3,200 00 | |
| To pay to the reporters of the Senate the usual extra compensation for the first session of the thirty-fifth Congress, eight hundred dollars each | 3,200 00 | |
| To pay to the reporters of the Senate the usual extra compensation for the second session of the thirty-fifth Congress, eight hundred dollars each | 3,200 00 | |
| For one hundred copies of the Congressional Globe and Appendix, and for binding the same, for the second session of the thirty-fifth Congress, for the use of the Library of the House of Representatives | 440 00 | |
| For the compensation of the draughtsman and clerks employed upon the land maps, clerks to committees, and temporary clerks in the office of the Clerk of the House of Representatives | 17,800 00 | |
| For two mail boys at nine hundred dollars each, and the messenger in charge of the south extension | 3,300 00 | |
| For furnishing the committee rooms, retiring rooms, and offices in the south wing of the Capitol extension, with gas-fixtures, chandeliers, iron safes, and other furniture | 40,000 00 | |
| Amount carried forward | 1,544,182 30 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $152,346 00 | $12,581,735 40 |
| For gradual increase and expense of library | 1,000 00 | |
| For expenses of the board of visitors | 3,000 00 | |
| For forage for artillery and cavalry horses | 8,640 00 | |
| For supplying horses for cavalry and artillery practice | 1,000 00 | |
| For barracks for dragoon detachment | 1,500 00 | |
| For barracks for artillery detachment | 6,500 00 | |
| For purchase of a bell, and mounting the same with the clock on one of the public buildings | 450 00 | |
| For repairs to officers' quarters | 500 00 | |
| For models for the department of cavalry | 250 00 | |
| For extension of water pipes and increase of reservoir | 2,500 00 | |
| For targets and batteries for artillery exercise | 150 00 | |
| For gas pipes and retorts, extension to cadets' mess-hall, academic hall, and other public buildings | 2,500 00 | |
| For stables for dragoon and artillery horses | 2,468 00 | |
| | | 182,804 00 |
| *By the act to amend the "Act to incorporate the Columbia Institution for the Instruction of the Deaf and Dumb and the Blind," approved February sixteenth, eighteen hundred and fifty-seven.* | | |
| For the payment of salaries and incidental expenses of said institution | | 3,000 00 |
| *By the act making appropriations for the legislative, executive, and judicial expenses of government for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| LEGISLATIVE. | | |
| For compensation and mileage of senators | 162,750 00 | |
| For compensation of the officers, clerks, messengers, and others receiving an annual salary in the service of the Senate, viz: | | |
| Secretary of the Senate | 3,600 00 | |
| Officer charged with disbursements of the Senate | 480 00 | |
| Chief clerk | 2,500 00 | |

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| **EXECUTIVE.** | | |
| For compensation of the President of the United States | 25,000 00 | |
| For compensation of the Vice President of the United States | 8,000 00 | |
| For compensation to secretary to sign patents for lands | 1,500 00 | |
| For compensation to the private secretary, steward, and messenger of the President of the United States | 4,600 00 | |
| For contingent expenses of the executive office, including stationery therefor | 350 00 | |
| **DEPARTMENT OF STATE.** | | |
| For compensation of the Secretary of State and Assistant Secretary of State, clerks, messenger, assistant messenger, and laborers in his office | 57,800 00 | |
| **FOR THE INCIDENTAL AND CONTINGENT EXPENSES OF SAID DEPARTMENT.** | | |
| For proof-reading, packing, and distributing laws and documents, including cases and transportation, and miscellaneous expenses | 5,000 00 | |
| For stationery, blank books, binding, furniture, fixtures, repairs, painting, and glazing | 6,500 00 | |
| For newspapers | 600 00 | |
| For miscellaneous items | 2,000 00 | |
| To enable the Secretary of State to purchase fifty copies, each, of volumes twenty-two and twenty-three of Howard's Reports of the Decisions of the Supreme Court of the United States | 500 00 | |
| To enable the Secretary of State to carry into effect the act entitled "An act for the admission of the State of Kansas into the Union" | 10,000 00 | |
| **NORTHEAST EXECUTIVE BUILDING.** | | |
| For compensation of four watchmen and two laborers of the northeast executive building | 3,600 00 | |
| For contingent expenses of said building, viz: for fuel, lights, repairs, and miscellaneous expenses | 4,300 00 | |
| **TREASURY DEPARTMENT.** | | |
| For compensation of the Secretary of the Treasury, Assistant Secretary of the Treasury, clerks, messenger, assistant messenger, and laborers in his office | 48,600 00 | |
| For compensation of the First Comptroller, and the clerks, messenger, and laborers in his office | 28,340 00 | |
| For compensation of the Second Comptroller, and the clerks, messenger, and laborer in his office | 26,840 00 | |
| Amount carried forward | 2,024,691 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $2,024,691 96 | $12,767,539 40 |
| For compensation of the First Auditor, and the clerks, messenger, assistant messenger, and laborer in his office | 35,940 00 | |
| For compensation of the Second Auditor, and the clerks, messenger, assistant messenger, and laborer in his office | 35,540 00 | |
| For compensation of the Third Auditor, and the clerks, messenger, assistant messenger, and laborers in his office | 132,640 00 | |
| For compensation of the Fourth Auditor, and the clerks, messenger, and assistant messenger in his office | 27,740 00 | |
| For compensation of the Fifth Auditor, and the clerks, messenger, and laborer in his office | 17,840 00 | |
| For compensation of the Auditor of the Treasury for the Post Office Department, and the clerks, messenger, assistant messenger, and laborers in his office | 172,340 00 | |
| For compensation of the Treasurer of the United States, and the clerks, messenger, assistant messenger, and laborers in his office | 25,740 00 | |
| For compensation of the Register of the Treasury, and the clerks, messenger, assistant messenger, and laborers in his office | 50,340 00 | |
| For compensation of the Solicitor of the Treasury, and the clerks and messenger in his office | 17,140 00 | |
| For compensation of the Commissioner of the Customs, and the clerks, messenger, and laborer in his office | 20,440 00 | |
| For compensation of the clerks, messenger, and laborer of the Light-house Board | 9,240 00 | |
| *Contingent expenses of the Treasury Department.* | | |
| In the office of the Secretary of the Treasury: | | |
| For copying, blank books, stationery, binding, sealing ships' registers, translating foreign languages, advertising, and extra clerk hire for preparing and collecting information to be laid before Congress, and for miscellaneous items | 13,750 00 | |
| In the office of the First Comptroller: | | |
| For furniture, blank books, binding, stationery, public documents, State and Territorial statutes, and miscellaneous items, and the Union and National Intelligencer newspapers | 2,200 00 | |
| In the office of the Second Comptroller: | | |
| For blank books, binding, stationery, pay for the National Intelligencer and Union, to be filed and preserved for the use of the office, office furniture, and miscellaneous items | 1,500 00 | |

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| In the office of the First Auditor: | | |
| For blank books, binding, stationery, office furniture, cases for records and official papers, and miscellaneous items, including subscription for the Union and National Intelligencer, to be filed for the use of the office | 1,800 00 | |
| In the office of the Second Auditor: | | |
| For blank books, binding, stationery, office furniture, and miscellaneous items, including two of the daily city newspapers, to be filed, bound, and preserved for the use of the office | 1,200 00 | |
| In the office of the Third Auditor: | | |
| For blank books, binding, stationery, office furniture, carpeting, two newspapers, the Union and Intelligencer, preserving files and papers, bounty-land service, miscellaneous items and arrearages | 3,540 00 | |
| In the office of the Fourth Auditor: | | |
| For stationery, books, binding, labor, and miscellaneous items | 1,100 00 | |
| In the office of the Fifth Auditor: | | |
| For blank books, binding, stationery, office furniture, carpeting, and miscellaneous expenses, in which are included two daily newspapers | 1,000 00 | |
| In the office of the Auditor of the Treasury for the Post Office Department: | | |
| For stationery, blank books, binding, ruling, miscellaneous items, for file-boards, repairs, cases and desks for safe keeping of papers, furniture, lights, washing towels, ice, horse for messenger, telegraphic despatches, and stoves | 12,550 00 | |
| In the office of the Treasurer: | | |
| For blank books, binding, stationery, and miscellaneous items | 1,000 00 | |
| In the office of the Register: | | |
| For ruling and full-binding books for recording collectors' quarterly abstracts of commerce and navigation, and blank abstracts for their use, blank books, binding, and stationery, arranging and binding cancelled marine papers and records, and miscellaneous items, including office furniture and carpeting, copper-plate printed certificates of registers of vessels and crew lists | 10,000 00 | |
| In the office of the Solicitor: | | |
| For blank books, binding, stationery, labor, and miscellaneous items, and for statutes and reports | 2,200 00 | |
| In the office of the Commissioner of Customs: | | |
| For blank books, binding, stationery, and miscellaneous items | 2,000 00 | |
| LIGHT-HOUSE BOARD. | | |
| For blank books, binding, stationery, miscellaneous expenses and postage | 750 00 | |
| FOR THE GENERAL PURPOSES OF THE SOUTHEAST EXECUTIVE BUILDING. | | |
| For compensation of eight watchmen and nine laborers of the southeast executive building | 10,200 00 | |
| Amount carried forward | 2,634,421 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $2,634,421 96 | $12,767,539 40 |
| For contingent expenses of said building, viz: | | |
| Fuel, lights, repairs, and miscellaneous | 8,500 00 | |
| For compensation of four watchmen and two laborers for the south extension of the southeast executive building | 3,600 00 | |
| For contingent expenses of said building, fuel, and miscellaneous items | 3,000 00 | |
| DEPARTMENT OF THE INTERIOR. | | |
| For compensation of the Secretary of the Interior, and the clerks, messengers, assistant messengers, watchmen, and laborers in his office | 36,900 00 | |
| For compensation of the Commissioner of the General Land Office, and the recorder, draughtsman, assistant draughtsman, clerks, messengers, assistant messengers, packers, watchmen, and laborers in his office | 172,690 00 | |
| For additional clerks in the General Land Office, under the act of third March, one thousand eight hundred and fifty-five, granting bounty lands, and for laborers employed therein | 58,400 00 | |
| For compensation of the Commissioner of Indian Affairs, and the clerks, messenger, assistant messenger, watchmen, and laborer in his office | 31,940 00 | |
| For compensation of the Commissioner of Pensions, and the clerks, messenger, assistant messenger, and laborers in his office | 109,340 00 | |
| For compensation of the Commissioner of Public Buildings, and the clerk in his office | 3,200 00 | |
| *Contingent expenses—Department of the Interior.* | | |
| Office of the Secretary of the Interior: | | |
| For books, stationery, furniture, fuel, lights, and other contingencies, and for books and maps for the library | 7,200 00 | |
| For expense of packing and distributing the congressional journals and documents in pursuance of the provisions contained in the joint resolution of Congress approved twenty-eighth January, eighteen hundred and fifty-seven | 6,000 00 | |
| For the preservation of the collections of the exploring and surveying expeditions of the government | 4,000 00 | |
| For the transfer to, and new arrangement of those collections in, the Smithsonian Institution | 1,000 00 | |
| To enable the Secretary of the Interior to pay the superintendent of the building occupied by said Secretary and his department, from the first day of January, eighteen hundred and fifty-five, to the thirtieth | | |

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| For compensation of the President of the United States | 25,000 00 | |
| For compensation of the Vice President of the United States | 8,000 00 | |
| For compensation to secretary to sign patents for lands | 1,500 00 | |
| For compensation to the private secretary, steward, and messenger of the President of the United States | 4,600 00 | |
| For contingent expenses of the executive office, including stationery therefor | 350 00 | |
| **DEPARTMENT OF STATE.** | | |
| For compensation of the Secretary of State and Assistant Secretary of State, clerks, messenger, assistant messenger, and laborers in his office | 57,800 00 | |
| **FOR THE INCIDENTAL AND CONTINGENT EXPENSES OF SAID DEPARTMENT.** | | |
| For proof-reading, packing, and distributing laws and documents, including cases and transportation, and miscellaneous expenses | 5,000 00 | |
| For stationery, blank books, binding, furniture, fixtures, repairs, painting, and glazing | 6,500 00 | |
| For newspapers | 600 00 | |
| For miscellaneous items | 2,000 00 | |
| To enable the Secretary of State to purchase fifty copies, each, of volumes twenty-two and twenty-three of Howard's Reports of the Decisions of the Supreme Court of the United States | 500 00 | |
| To enable the Secretary of State to carry into effect the act entitled "An act for the admission of the State of Kansas into the Union" | 10,000 00 | |
| **NORTHEAST EXECUTIVE BUILDING.** | | |
| For compensation of four watchmen and two laborers of the northeast executive building | 3,600 00 | |
| For contingent expenses of said building, viz: for fuel, lights, repairs, and miscellaneous expenses | 4,300 00 | |
| **TREASURY DEPARTMENT.** | | |
| For compensation of the Secretary of the Treasury, Assistant Secretary of the Treasury, clerks, messenger, assistant messenger, and laborers in his office | 48,600 00 | |
| For compensation of the First Comptroller, and the clerks, messenger, and laborers in his office | 28,340 00 | |
| For compensation of the Second Comptroller, and the clerks, messenger, and laborer in his office | 26,840 00 | |
| Amount carried forward | 2,024,691 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $2,024,691 96 | $12,767,539 40 |
| For compensation of the First Auditor, and the clerks, messenger, assistant messenger, and laborer in his office | 35,940 00 | |
| For compensation of the Second Auditor, and the clerks, messenger, assistant messenger, and laborer in his office | 35,540 00 | |
| For compensation of the Third Auditor, and the clerks, messenger, assistant messenger, and laborers in his office | 132,640 00 | |
| For compensation of the Fourth Auditor, and the clerks, messenger, and assistant messenger in his office | 27,740 00 | |
| For compensation of the Fifth Auditor, and the clerks, messenger, and laborer in his office | 17,840 00 | |
| For compensation of the Auditor of the Treasury for the Post Office Department, and the clerks, messenger, assistant messenger, and laborers in his office | 172,340 00 | |
| For compensation of the Treasurer of the United States, and the clerks, messenger, assistant messenger, and laborers in his office | 25,740 00 | |
| For compensation of the Register of the Treasury, and the clerks, messenger, assistant messenger, and laborers in his office | 50,340 00 | |
| For compensation of the Solicitor of the Treasury, and the clerks and messenger in his office | 17,140 00 | |
| For compensation of the Commissioner of the Customs, and the clerks, messenger, and laborer in his office | 20,440 00 | |
| For compensation of the clerks, messenger, and laborer of the Light-house Board | 9,240 00 | |
| *Contingent expenses of the Treasury Department.* | | |
| In the office of the Secretary of the Treasury: | | |
| For copying, blank books, stationery, binding, sealing ships' registers, translating foreign languages, advertising, and extra clerk hire for preparing and collecting information to be laid before Congress, and for miscellaneous items | 13,750 00 | |
| In the office of the First Comptroller: | | |
| For furniture, blank books, binding, stationery, public documents, State and Territorial statutes, and miscellaneous items, and the Union and National Intelligencer newspapers | 2,200 00 | |
| In the office of the Second Comptroller: | | |
| For blank books, binding, stationery, pay for the National Intelligencer and Union, to be filed and preserved for the use of the office, office furniture, and miscellaneous items | 1,500 00 | |

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| Office of the Adjutant General: | | |
| For blank books, binding, stationery, and miscellaneous items | 2,000 00 | |
| Office of the Quartermaster General: | | |
| For blank books, binding, stationery, and miscellaneous items | 1,200 00 | |
| Office of the Paymaster General: | | |
| For blank books, binding, stationery, and miscellaneous items | 500 00 | |
| Office of the Chief Engineer: | | |
| For blank books, binding, stationery, and miscellaneous items, including two daily Washington papers | 900 00 | |
| Office of the Surgeon General: | | |
| For blank books, binding, stationery, and miscellaneous items | 400 00 | |
| Office of Colonel of Ordnance: | | |
| For blank books, binding, stationery, and miscellaneous items | 950 00 | |
| Office of the Colonel of Topographical Engineers: | | |
| For blank books, binding, stationery, and miscellaneous items | 1,200 00 | |
| *For the general purposes of the northwest executive building.* | | |
| For compensation of four watchmen and two laborers of the northwest executive building | 3,600 00 | |
| For fuel, light, and miscellaneous items | 4,000 00 | |
| | 3,850 00 | |
| *For the general purposes of the building corner of F and Seventeenth streets.* | 4,800 00 | |
| For compensation of superintendent, four watchmen, and two laborers, for said building | 3,850 00 | |
| For fuel, compensation of firemen, and miscellaneous items | 4,800 00 | |
| NAVY DEPARTMENT. | | |
| For compensation of the Secretary of the Navy, and the clerks, messenger, assistant messenger, and laborer, in his office | 29,600 00 | |
| For compensation of the chief of the bureau of navy yards and docks, and the clerks, messenger, and laborer in his office | 14,140 00 | |
| For compensation of the chief of the bureau of ordnance and hydrography, and the clerks, messenger, and laborer in his office | 12,340 00 | |
| For compensation of the chief of the bureau of construction, equipment, and repairs, and of the engineer-in-chief, and the clerks, messenger, and laborers in his office | 21,340 00 | |
| For compensation of the clerks, messenger, and laborer, in the bureau of provisions and clothing | 8,840 00 | |
| Amount carried forward | 3,550,591 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $2,634,421 96 | $12,767,539 40 |
| For contingent expenses of said building, viz: | | |
| Fuel, lights, repairs, and miscellaneous | 8,500 00 | |
| For compensation of four watchmen and two laborers for the south extension of the southeast executive building | 3,600 00 | |
| For contingent expenses of said building, fuel, and miscellaneous items | 3,000 00 | |
| DEPARTMENT OF THE INTERIOR. | | |
| For compensation of the Secretary of the Interior, and the clerks, messengers, assistant messengers, watchmen, and laborers in his office | 36,900 00 | |
| For compensation of the Commissioner of the General Land Office, and the recorder, draughtsman, assistant draughtsman, clerks, messengers, assistant messengers, packers, watchmen, and laborers in his office | 172,690 00 | |
| For additional clerks in the General Land Office, under the act of third March, one thousand eight hundred and fifty-five, granting bounty lands, and for laborers employed therein | 58,400 00 | |
| For compensation of the Commissioner of Indian Affairs, and the clerks, messenger, assistant messenger, watchmen, and laborer in his office | 31,940 00 | |
| For compensation of the Commissioner of Pensions, and the clerks, messenger, assistant messenger, and laborers in his office | 109,340 00 | |
| For compensation of the Commissioner of Public Buildings, and the clerk in his office | 3,200 00 | |
| *Contingent expenses—Department of the Interior.* | | |
| Office of the Secretary of the Interior: | | |
| For books, stationery, furniture, fuel, lights, and other contingencies, and for books and maps for the library | 7,200 00 | |
| For expense of packing and distributing the congressional journals and documents in pursuance of the provisions contained in the joint resolution of Congress approved twenty-eighth January, eighteen hundred and fifty-seven | 6,000 00 | |
| For the preservation of the collections of the exploring and surveying expeditions of the government | 4,000 00 | |
| For the transfer to, and new arrangement of those collections in, the Smithsonian Institution | 1,000 00 | |
| To enable the Secretary of the Interior to pay the superintendent of the building occupied by said Secretary and his department, from the first day of January, eighteen hundred and fifty-five, to the thirtieth | | |

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|---|---|---|
| For repairs of the General Post Office building, for office furniture, glazing, painting, whitewashing, and for keeping the fire-places and furnaces in order | 4,000 00 | |
| To meet the expenses incident to the completion of a large portion of the General Post Office extension, viz: | | |
| For furnishing partially eighty-one rooms, incidental expenses in all other portions of the new building, fuel, gas, candles, day watchman, miscellaneous items, and ten laborers at six hundred dollars each | 28,000 00 | |
| *Printing for executive departments.* | | |
| For paper and printing for the executive departments, including the paper, printing, and binding of the annual statement of commerce and navigation of the United States, and the paper and printing of the annual estimates of appropriations | 55,000 00 | |
| MINT OF THE UNITED STATES. | | |
| *At Philadelphia.* | | |
| For salaries of the director, treasurer, assayer, melter and refiner, chief coiner and engraver, assistant assayer, assistant melter and refiner, and seven clerks | 27,900 00 | |
| For wages of workmen and adjusters | 74,800 00 | |
| For incidental and contingent expenses, including wastage, in addition to other available funds | 75,000 00 | |
| For specimens of ores and coins to be reserved at the mint | 300 00 | |
| For transportation of bullion from New York assay office to the United States mint for coinage | 10,000 00 | |
| *At San Francisco, California.* | | |
| For salaries of superintendent, treasurer, assayer, melter and refiner, coiner, and five clerks | 26,455 00 | |
| For wages of workmen and adjusters | 166,894 00 | |
| For incidental and contingent expenses, including wastage, in addition to other available funds | 22,606 00 | |
| *At New Orleans.* | | |
| For salaries of superintendent, treasurer, assayer, coiner, melter and refiner, and three clerks | 18,300 00 | |
| For wages of workmen | 22,000 00 | |
| For incidental and contingent expenses, including wastage, in addition to other available funds | 20,900 00 | |
| Amount carried forward | 4,293,739 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $4,293,739 96 | $12,767,539 40 |
| *At Charlotte, North Carolina.* | | |
| For salaries of superintendent, coiner, assayer, and clerk | 4,500 00 | |
| *At Dahlonega, Georgia.* | | |
| For salaries of superintendent, coiner, assayer, and clerk | 5,300 00 | |
| For wages of workmen | 1,200 00 | |
| *Assay Office, New York.* | | |
| For salaries of officers and clerks | 21,100 00 | |
| GOVERNMENT IN THE TERRITORIES. | | |
| *Territory of Oregon.* | | |
| For salaries of governor, three judges, and secretary | 12,500 00 | |
| For contingent expenses of said Territory | 1,500 00 | |
| For compensation and mileage of the members of the legislative assembly, officers, clerks, and contingent expenses of the assembly | 20,000 00 | |
| *Territory of New Mexico.* | | |
| For salaries of governor, three judges, and secretary | 12,000 00 | |
| For contingent expenses of said Territory | 1,000 00 | |
| For compensation and mileage of the members of the legislative assembly, officers, clerks, and contingent expenses of the assembly | 20,000 00 | |
| *Territory of Utah.* | | |
| For salaries of governor, three judges, and secretary | 12,000 00 | |

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| For contingent expenses of said Territory | 1,500 00 | |
| *Territory of Washington.* | | |
| For salaries of governor, three judges, and secretary | 12,500 00 | |
| For contingent expenses of said Territory | 1,500 00 | |
| For compensation and mileage of the members of the legislative assembly, officers, clerks, and contingent expenses of the assembly | 20,000 00 | |
| *Territory of Nebraska.* | | |
| For salaries of governor, three judges, and secretary | 10,500 00 | |
| For contingent expenses of said Territory | 1,000 00 | |
| For compensation and mileage of the members of the legislative assembly, officers, clerks, and contingent expenses of the assembly | 20,000 00 | |
| *Territory of Kansas.* | | |
| For salaries of governor, three judges, and secretary | 10,500 00 | |
| For contingent expenses of said Territory | 1,500 00 | |
| For compensation and mileage of the members of the legislative assembly, officers, clerks, and contingent expenses of the assembly | 20,000 00 | |
| *Territory of Minnesota.* | | |
| For defraying the expenses incurred in taking the census of the Territory of Minnesota, under the act approved twenty-sixth February, eighteen hundred and fifty-seven | 20,000 00 | |
| JUDICIARY. | | |
| For salaries of the chief justice of the supreme court and eight associate justices | 54,500 00 | |
| For salaries of the district judges | 108,750 00 | |
| For salary of the circuit judge of California | 6,000 00 | |
| For salaries of the chief justice of the District of Columbia, the associate judges, and the judges of the criminal court and the orphans' court | 15,750 00 | |
| Amount carried forward | 4,708,839 96 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $4,708,839 96 | $12,767,539 40 |
| OFFICE OF THE ATTORNEY GENERAL. | | |
| For salaries of the Attorney General, and the clerks and messenger in his office | 18,100 00 | |
| For contingent expenses of the office of the Attorney General | 2,500 00 | |
| For purchase of law and necessary books, and binding, for the office of the Attorney General | 1,000 00 | |
| For the purchase of deficient State reports and statutes for the office of the Attorney General | 1,000 00 | |
| For fuel and labor for the office of the Attorney General | 1,000 00 | |
| For furniture and bookcases for the office of the Attorney General | 1,000 00 | |
| For legal assistance and other necessary expenditures in the disposal of private land claims in California | 12,000 00 | |
| For services of special counsel, and other extraordinary expenses, in defending the title of the United States to public property in California | 40,000 00 | |
| For the employment of such number of clerks, not exceeding three, by the district attorney of the northern district of California, as may be necessary to transcribe the records of the district court in land cases, upon which appeals have been or may be taken to the Supreme Court | Indefinite. | |
| For salary of the reporter of the decisions of the Supreme Court | 1,300 00 | |
| For compensation of the district attorneys | 11,750 00 | |
| For compensation of the marshals | 10,400 00 | |
| INDEPENDENT TREASURY. | | |
| For salaries of the assistant treasurers of the United States at New York, Boston, Charleston, and St. Louis | 16,500 00 | |
| For additional salary of the treasurer of the mint at Philadelphia | 1,000 00 | |
| For additional salary of the treasurer of the branch mint at New Orleans | 500 00 | |
| For salaries of five of the additional clerks authorized by the acts of sixth August, eighteen hundred and forty-six, and paid under acts of twelfth August, eighteen hundred and forty-eight, third March eighteen hundred and fifty-one, and third March, eighteen hundred and fifty-five | 5,700 00 | |
| For salary of additional clerk in office of assistant treasurer at Boston | 1,200 00 | |
| For salaries of clerks, messengers, and watchmen in the office of the assistant treasurer at New York | 13,900 00 | |
| For contingent expenses under the act for the safe-keeping, collecting, transfer, and disbursement of the public revenue of sixth August, eighteen hundred and forty-six, in addition to premium received on transfer drafts | 10,000 00 | |

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| For salaries of nine supervising and fifty local inspectors, appointed under act of thirtieth August, eighteen hundred and fifty-two, for the better protection of the lives of passengers by steamboats, with travelling and other expenses incurred by them | 80,000 00 | |
| EXPENSES OF THE COLLECTION OF REVENUE FROM LANDS. | | |
| To meet the expenses of collecting the revenue from the sale of public lands in the several States and Territories: | | |
| For salaries and commissions of registers of land offices and receivers of public moneys | 120,000 00 | |
| For defraying the expenses of the supreme, circuit, and district courts of the United States, including the District of Columbia; also for jurors and witnesses, in aid of the funds arising from fines, penalties, and forfeitures incurred in the fiscal year ending June thirtieth, eighteen hundred and fifty-nine, and previous years; and likewise for defraying the expenses of suits in which the United States are concerned, and of prosecutions for offences committed against the United States, and for the safe-keeping of prisoners | 1,000,000 00 | |
| PENITENTIARY. | | |
| For compensation of the warden, clerk, physician, chaplain, assistant keepers, guards, and matron of the penitentiary of the district of Columbia | 12,540 00 | |
| For compensation of three inspectors of said penitentiary | 750 00 | |
| For the support and maintenance of said penitentiary | 7,920 25 | |
| For compensation of two additional guards, hereby authorized | 1,320 00 | |
| For compensation, in part, for the messenger in charge of the main furnace in the Capitol | 420 00 | |
| For stationery, blank books, plans, drawings, and other contingent expenses of the office of the Commissioner of Public Buildings | 250 00 | |
| For compensation to the laborer in charge of the water closets in the Capitol | 438 00 | |
| For compensation to the public gardener | 1,440 00 | |
| For compensation of twenty-two laborers employed in the public grounds and President's garden | 13,200 00 | |
| For compensation of the keeper of the western gate, Capitol square | 876 00 | |
| For compensation of two day watchmen employed in the Capitol square | 1,200 00 | |
| For compensation of two night watchmen employed at the President's house | 1,200 00 | |
| For compensation of the doorkeeper at the President's house | 600 00 | |
| For compensation of the assistant doorkeeper at the President's house | 600 00 | |
| For compensation of one night watchman employed for the better protection of the buildings lying south of the Capitol, and used as public stables and carpenters' shops | 600 00 | |
| For compensation of four draw-keepers at the Potomac bridge, and for fuel, oil, and lamps | 5,584 40 | |
| Amount carried forward | 6,106,628 61 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $6,106,628 61 | $12,767,539 40 |
| For compensation of two draw-keepers at the two bridges across the eastern branch of the Potomac, and for fuel, oil, and lamps | 1,180 00 | |
| For compensation of the auxiliary guard, and for fuel and oil for lamps | 19,400 00 | |
| For furnace-keeper at the President's house | 600 00 | |
| | | 6,127,808 61 |
| *By the act to extend an act entitled "An act to continue half-pay to certain widows and orphans," approved February three, eighteen hundred and fifty-three.* | | |
| For the continuance of such half-pay, under the following terms and limitations, viz: to such widows during life, and to such child or children, where there is no widow, whilst under the age of sixteen years, to commence from the expiration of the half-pay provided for by the first section of the act entitled "An act to continue half-pay to certain widows and orphans," approved February three, eighteen hundred and fifty-three | | Indefinite. |
| *By the act making an appropriation for the payment of clerks employed in the offices of the registers of the land offices at Oregon City and Winchester, in the Territory of Oregon.* | | |
| To enable the Secretary of the Interior to reimburse the registers of the land offices at Oregon City and Winchester, in the Territory of Oregon, for expenses incurred by them in the employment of clerks actually required for the transaction of the business of their respective offices, growing out of an act entitled "An act to create the office of surveyor general of the public lands in Oregon, and to provide for the survey and to make donations to settlers of the said public lands," approved September the twenty-seventh, one thousand eight hundred and fifty | | 7,000 00 |
| *By the act to authorize the President of the United States, in conjunction with the State of Texas, to run and mark the boundary lines between the Territories of the United States and the State of Texas.* | | |
| To run and mark the boundary lines between the Territories of the United States and the State of Texas: Beginning at the point where the one hundredth degree of longitude west from Greenwich crosses Red river, and running thence north to the point where said one hundreth degree of longitude intersects the parallel of thirty-six degrees thirty minutes north latitude; and thence west with the said parallel of thirty-six degrees and thirty minutes north latitude to the point where it intersects the one hundred and third | | |

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| degree of longitude west from Greenwich; and thence south with the said one hundred and third degree of longitude to the thirty-second parallel of north latitude; and thence west with the said thirty-second degree of north latitude to the Rio Grande | | 80,000 00 |
| *By the act making appropriations for the consular and diplomatic expenses of the government for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For salaries of envoys extraordinary, ministers, and commissioners of the United States at Great Britain, France, Russia, Prussia, Spain, Austria, Brazil, Mexico, China, Chili, Peru, Portugal, Switzerland, Rome, Naples, Sardinia, Belgium, Holland, Denmark, Sweden, Turkey, Buenos Ayres, New Granada, Bolivia, Ecuador, Venezuela, Guatemala, Nicaragua, and Sandwich Islands | 274,000 00 | |
| For salaries of the secretaries of legation of the United States | 12,000 00 | |
| For salaries of assistant secretaries of legation at London and Paris | 3,000 00 | |
| For salary of the secretary of legation to China, acting as interpreter | 5,000 00 | |
| For salary of the secretary of legation to Turkey, acting as dragoman | 3,000 00 | |
| For contingent expenses of all the missions abroad | 50,000 00 | |
| For contingent expenses of foreign intercourse | 60,000 00 | |
| For expenses of intercourse with the Barbary powers | 3,000 00 | |
| For expenses of the consulates in the Turkish dominions, viz: interpreters, guards, and other expenses of the consulates at Constantinople, Smyrna, Candia, Alexandria, and Beirout | 2,500 00 | |
| For the relief and protection of American seamen in foreign countries | 150,000 00 | |
| For expenses which may be incurred in acknowledging the services of the masters and crews of foreign vessels in rescuing citizens and vessels of the United States from shipwreck, to be expended under the direction of the President of the United States | 10,000 00 | |
| For the purchase of blank books, stationery, arms of the United States, seals, presses, and flags, and for the payment of postages and miscellaneous expenses of the consuls of the United States | 40,000 00 | |
| For office rent for those consuls general, consuls, and commercial agents, who are not allowed to trade, including loss by exchange thereon | 27,370 00 | |
| For salaries of consuls general at Quebec, Calcutta, Alexandria, Simoda, Havana, Constantinople, Frankfort-on-the-Main; consuls at Liverpool, London, Melbourne, Hong Kong, Glasgow, Mauritius, Singapore, Belfast, Cork, Dundee, Demarara, Halifax, Kingston, (Jamaica) Leeds, Manchester, Nassau, (New Providence,) Southampton, Turk's Island, Prince Edwards' Island, Havre, Paris, Marseilles, Bordeaux, La Rochelle, Lyons, Moscow, Odessa, Revel, Saint Petersburg, Matanzas, Trinidad de Cuba, Santiago de Cuba, San Juan, (Porto Rico,) Cadiz, Malaga, Ponce, (Porto Rico,) Trieste, Vienna, Aix-la-Chapelle, Canton, Shanghai, Fouchou, Amoy, Ningpo, Beirout, Smyrna, Jerusalem, Rotterdam, Amsterdam, Antwerp, Funchal, Oporto, St. Thomas, Elsineur, Genoa, Basle, Geneva, Messina, Naples, Palermo, Leipsic, Munich, Leghorn, Stuttgardt, Bremen, Hamburg, Tangiers, Tripoli, Tunis, Rio de Janeiro, Pernambuco, Vera Cruz, Acapulco, | | |
| Amount carried forward | 639,870 00 | 18,982,348 01 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $639,870 00 | $18,962,348 01 |
| Callao, Valparaiso, Buenos Ayres, San Juan del Sur, Aspinwall, Panama, Laguayra, Honolula, Lahaina, Capetown, Falkland Islands, Venice, Stettin, Candia, Cyprus, Batavia, Fayal, Santiago, (Cape de Verdes,) Saint Croix, Spezzia, Athens, Zanzibar, Bahia, Maranham Island, Para, Rio Grande, Matamoras, Mexico, (city,) Tampico, Paso del Norte, Tabasco, Paita, Tumbez, Talcahuano, Carthagena, Sabanillo, Omoa, Guayaquil, Cobija, Montevideo, Tahita, Bay of Islands, Apia, Lanthala; commercial agents at San Juan del Norte, Port-au-Prince, San Domingo, (city,) St. Paul de Loanda, (Angola,) Monrovia, Gaboon, Cape Haytien, Aux Cayes, and Amoor river | 173,750 00 | |
| For interpreters to the consulates in China | 4,500 00 | |
| For compensation of the commissioner, secretary, chief astronomer and surveyor, assistant astronomer and surveyor, clerk, and for provisions, transportation, and contingencies of the commission to run and mark the boundary line between the United States and the British poesessions bounding on Washington Territory | 71,000 00 | |
| For compensation and per diem of the commissioner, compensation of the surveyor, and for the payment of all expenses of the commissioner under the reciprocity treaty with Great Britain | 23,000 00 | 912,120 00 |
| *By the act making appropriations for the naval service for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For pay of commission, warrant, and petty officers, and seamen, including the engineer corps of the navy | 3,805,405 00 | |
| For provisions for commission, warrant, and petty officers, and seamen, including engineers and marines attached to vessels for sea service | 941,700 00 | |
| For surgeons' necessaries and appliances for the sick and hurt of the navy, including the engineer and marine corps | 32,150 00 | |
| For increase, repair, armament, and equipment of the navy, including the wear and tear of vessels in commission, fuel for steamers, and purchase of hemp for the navy | 2,850,000 00 | |
| For ordnance and ordnance stores and small arms, including incidental expenses | 598,000 00 | |
| For contingent expenses that may accrue for the following purposes, viz: freight and transportation, printing and stationery, advertising in newspapers, books, maps, models, and drawings, purchase and repair of fire-engines and machinery, repairs of and attending to steam engines in navy yards, purchase and maintenance of horses and oxen and drawing teams, carts, timber-wheels, and the purchase and repairs of workmens' tools, postage of public letters, fuel, oil and candles for navy yards and shore stations, pay of watchmen and incidental labor not chargeable to any other appropriation, transportation to and labor attending the delivery of provisions and stores on foreign stations, wharfage, dockage, and rent, travelling expenses | | |

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| for salaries of nine supervising and fifty local inspectors, appointed under act of thirtieth August, eighteen hundred and fifty-two, for the better protection of the lives of passengers by steamboats, with travelling and other expenses incurred by them | 80,000 00 | |
| EXPENSES OF THE COLLECTION OF REVENUE FROM LANDS. | | |
| To meet the expenses of collecting the revenue from the sale of public lands in the several States and Territories: | | |
| For salaries and commissions of registers of land offices and receivers of public moneys | 120,000 00 | |
| For defraying the expenses of the supreme, circuit, and district courts of the United States, including the District of Columbia; also for jurors and witnesses, in aid of the funds arising from fines, penalties, and forfeitures incurred in the fiscal year ending June thirtieth, eighteen hundred and fifty-nine, and previous years; and likewise for defraying the expenses of suits in which the United States are concerned, and of prosecutions for offences committed against the United States, and for the safe-keeping of prisoners | 1,000,000 00 | |
| PENITENTIARY. | | |
| For compensation of the warden, clerk, physician, chaplain, assistant keepers, guards, and matron of the penitentiary of the district of Columbia | 12,540 00 | |
| For compensation of three inspectors of said penitentiary | 750 00 | |
| For the support and maintenance of said penitentiary | 7,920 25 | |
| For compensation of two additional guards, hereby authorized | 1,320 00 | |
| For compensation, in part, for the messenger in charge of the main furnace in the Capitol | 420 00 | |
| For stationery, blank books, plans, drawings, and other contingent expenses of the office of the Commissioner of Public Buildings | 250 00 | |
| For compensation to the laborer in charge of the water closets in the Capitol | 438 00 | |
| For compensation to the public gardener | 1,440 00 | |
| For compensation of twenty-two laborers employed in the public grounds and President's garden | 13,200 00 | |
| For compensation of the keeper of the western gate, Capitol square | 876 00 | |
| For compensation of two day watchmen employed in the Capitol square | 1,200 00 | |
| For compensation of two night watchmen employed at the President's house | 1,200 00 | |
| For compensation of the doorkeeper at the President's house | 600 00 | |
| For compensation of the assistant doorkeeper at the President's house | 600 00 | |
| For compensation of one night watchman employed for the better protection of the buildings lying south of the Capitol, and used as public stables and carpenters' shops | 600 00 | |
| For compensation of four draw-keepers at the Potomac bridge, and for fuel, oil, and lamps | 5,584 40 | |
| Amount carried forward | 6,106,628 61 | 12,767,539 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $9,818,530 01 | $19,894,468 01 |
| *Boston.* | | |
| For reservoirs, boiler house, chimney and boilers at rope-walk, altering tar-kettles, machinery and bobbins for rope-walk, to complete machine shop, and for machinery for machine shop and foundry, extension of dry dock, and repairs of all kinds | 203,500 00 | |
| *New York.* | | |
| For boiler house and setting boilers, water pipes, drains, quay walls, sewer extended to quay wall, boiler to dredger, timber basin, repairs of oakum shop, filling ponds in yard, dredging channel and scows, piling site for marine barrarks, machinery for machine shop, boiler shop, saw mill, foundry, smithery, and brass foundry, and repairs of all kinds | 269,516 00 | |
| *Philadelphia.* | | |
| For extending gun-carriage shop, additional story to plumber's shop, dredging channels, and repairs of dredger, repairs of dry dock, and repairs of all kinds | 97,214 00 | |
| *Washington.* | | |
| For extension of navy store, for anchor shop and coal houses, pavements, drains, and gutters, machinery and tools, and repairs of all kinds | 99,100 00 | |
| *Norfolk.* | | |
| For continuation of quay wall, completing victualling establishment, completing grading and drainage, dredging channels, continuing ship-house number forty-eight, to be built of iron or wood, as may be deemed expedient, machinery and tools, completing reservoir, completing carpenters' shop, and repairs of all kinds | 285,808 00 | |
| To enable the Secretary of the Navy to purchase tools and furnish the machine shop and foundry at the Norfolk navy yard | 20,000 00 | |

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| *Pensacola.* | | |
| For continuing granite wharf, repairing and operating dock, filling and paving around dock basin, dredging in front of basin, repairs of railways, completing water pipes to permanent wharf, completing foundry, constructors' workshop, cistern at machine shop, trip hammer for smithery, blast pipes, and repairs of all kinds | 247,365 00 | |
| *Mare Island, California.* | | |
| For guard-house, number seventy-three, tar and pitch-house, number seventy-four, two cisterns, number forty-nine, grading, paving, continuing wharf, foundry and boiler establishment, gas works and Bishop's derrick | 317,971 00 | |
| HOSPITALS. | | |
| For the construction and completion of works, and for the current repairs of the several naval hospitals: | | |
| *Boston.* | | |
| For repairs of buildings and grounds | 3,000 00 | |
| To enable the Secretaries of the Treasury and Navy to ascertain and pay the actual value of the ten acres of land heretofore belonging to the naval hospital estate at Chelsea, Massachusetts, and ceded by the sixth section of "An act making appropriations for the civil and diplomatic service of the government," approved the third March, eighteen hundred and fifty-five, for the purposes of a marine hospital for the district of Boston and Charlestown, to the credit of the naval hospital fund, out of which the original purchase of the property so ceded was made | Indefinite. | |
| *New York.* | | |
| For completing heating apparatus, and repairs of buildings and fences | 13,200 00 | |
| *Naval Asylum, Philadelphia.* | | |
| For gateway and iron gate on Shippen street, and road from same; repairs to furnaces, grates, and ranges; painting main building and lodges; brick floors in governor's and surgeon's houses, cleaning and white-washing; gas tax, water tax, furniture for the asylum and repairs, and for general repairs | 8,500 00 | |
| For support of beneficiaries at the asylum | 26,392 00 | |
| Amount carried forward | 11,410,096 01 | 19,894,468 01 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $11,410,096 01 | $19,894,468 01 |
| *Norfolk.* | | |
| For repairs of buildings and appurtenances | 11,000 00 | |
| *Pensacola.* | | |
| For draining and filling ponds, and repairs of buildings and grounds | 18,700 00 | |
| MAGAZINES. | | |
| For the construction and completion of works, and for the current repairs at the several naval magazines: | | |
| *Portsmouth, New Hampshire.* | | |
| For gun carriage shop and storehouse, boiler room, engine and machinery, and repairs of all kinds | 46,600 00 | |
| *Boston.* | | |
| For repairs of all kinds | 1,500 00 | |
| *New York.* | | |
| For dredging channel to Ellis' island, and repairs of all kinds | 6,800 00 | |
| *Philadelphia.* | | |
| For repairs of all kinds | 1,000 00 | |
| *Norfolk.* | | |
| To complete ordnance building, continuation of sea wall at magazine, and for iron crane at Fort Norfolk | 61,265 00 | |

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| *Pensacola.* | | |
| For repairs of all kinds | 1,000 00 | |
| *Mare Island, California* | | |
| For shell house, magazine, keeper's house and grounds, tank house and filling room, railway and cars to transport powder to and from magazine, shot beds, cleaning and piling shot and shells | 11,450 00 | |
| For pay of superintendents, naval constructors, and all the civil establishments at the several navy yards and stations | 139,232 00 | |
| For the purchase of nautical instruments required for the use of the navy; for repairs of the same, and also of astronomical instruments; and for the purchase of nautical books, maps, and charts, and for backing and binding the same | 18,000 00 | |
| For printing and publishing sailing directions, hydrographical surveys, and astronomical observations, in addition to the balance on hand | 5,000 00 | |
| For continuing the publication of the series of Wind and Current Charts, and for defraying all the expenses connected therewith | 18,000 00 | |
| To enable the Secretary of the Navy to pay the salary of Professor James P. Espy | 2,000 00 | |
| For models, drawings, and copying; for postage, freight, and transportation; for keeping grounds in order; for fuel and lights; and for all other contingent expenses; and for the wages of persons employed at the United States Naval Observatory and Hydrographical Office, viz: one instrument maker, two watchmen, and one porter | 6,160 00 | |
| For improvement and repairs of buildings and grounds, and support of the Naval Academy at Annapolis, Md. | 45,671 22 | |
| For preparing for publication the American Nautical Almanac | 26,880 00 | |
| For five steam sloops, authorized by act third March, eighteen hundred and fifty-seven | 1,350,000 00 | |
| To enable the Secretary of the Navy to pay for the preparation of a code of regulations for the government of the navy, as directed in the seventh section of the act entitled "An act making appropriations for the naval service for the year ending the thirtieth of June, eighteen hundred and fifty-eight," approved third March, eighteen hundred and fifty-seven | 3,000 00 | |
| To enable the Secretary of the Navy to pay the expenses of courts of inquiry to investigate the cases of certain officers affected by the act, entitled "An act to amend at act entitled 'An act to promote the efficiency of the navy,'" approved sixteenth January, eighteen hundred and fifty-seven | 110,000 00 | |
| For completing the publication of the charts of the late expedition for the exploration of the river La Plata and its tributaries | 5,000 00 | |
| For compensation, from and after the first day of July, eighteen hundred and fifty-six, to the clerks and messengers at the navy yard and marine barracks at Washington, as authorized by the acts of April twenty-second, eighteen hundred and fifty-four, and August fifth, eighteen hundred and fifty-four | Indefinite. | |
| Amount carried forward | 13,298,354 23 | 19,894,468 01 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $13,298,354 23 | $19,894,468 01 |
| To defray the expenses and compensation of a commissioner to the republic of Paraguay, (should it be deemed proper by the President to appoint one,) in execution of the joint resolution of the present session "for the adjustment of difficulties with the republic of Paraguay" | 10,000 00 | |
| To enable the Secretary of the Navy to cause to be constructed, as speedily as may be consistent with the public interests, seven steam screw sloops-of-war, with full steam power, whose greatest draught of water shall not exceed fourteen feet, which ships shall combine the heaviest armament and greatest speed compatible with their character and tonnage; and one side-wheel war steamer, whose greatest draught shall not exceed eight feet, armed and provided for service in the China seas | 1,200,000 00 | 14,508,354 23 |
| *By the act making appropriations for sundry civil expenses of the government for the year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| SURVEY OF THE COAST. | | |
| For continuing the survey of the Atlantic and Gulf coast of the United States, (including compensation to superintendent and assistants, and excluding pay and emoluments of officers of the army and navy, and petty officers and men of the navy employed on the work) | 250,000 00 | |
| For continuing the survey of the western coast of the United States | 130,000 00 | |
| For continuing the survey of the Florida reefs and keys, (excluding pay and emoluments of officers of the army and navy, and petty officers and men of the navy employed on the work) | 40,000 00 | |
| For running a line to connect the triangulation on the Atlantic coast with that on the Gulf of Mexico, across the Florida peninsula | 10,000 00 | |
| For repairs of the Crawford, Madison, Mason, and George M. Bache, and other sailing vessels used in the coast survey | 10,000 00 | |
| For pay and rations of engineers for seven steamers, used in the hydrography of the coast survey, no longer supplied by the Navy Department | 12,800 00 | |
| To supply deficiency in the fund for the relief of sick and disabled seamen | 150,000 00 | |

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| **LIGHT-HOUSE ESTABLISHMENT.** | | |
| For the Atlantic, Gulf, and lake coasts, viz: | | |
| For supplying five hundred and fifty-six light-houses and beacon lights with oil, glass chimneys, wicks, chamois skins, polishing powder, whiting, and cleaning materials, transportation and other necessary expenses of the same, repairing and keeping in repair the lighting apparatus | 138,724 45 | |
| For repairs and incidental expenses, refitting and improvements of all the light-houses and buildings connected therewith | 173,289 21 | |
| For salaries of six hundred and eleven keepers of light-houses and light-beacons and their assistants | 60,000 00 | |
| For salaries of fifty-two keepers of light-vessels | 20,206 57 | |
| For seamen's wages, repairs, supplies, and incidental expenses of fifty-two light-vessels | 185,199 50 | |
| For expenses of raising, cleaning, painting, repairing, remooring, and supplying losses of buoys and day beacons, and for chains and sinkers for the same, and for coloring and numbering all the buoys | 82,228 78 | |
| **FOR THE COASTS OF CALIFORNIA, OREGON, AND WASHINGTON.** | | |
| For oil and other supplies for twenty-four lights, cleaning materials of all kinds, and transportation of the same, expenses of keeping lamps and machinery in repair, publishing notices to mariners of changes of aids to navigation | 1,472 91 | |
| For repairs and incidental expenses of twenty-four lights, and buildings connected therewith | 24,563 09 | |
| For maintenance of the vessel provided for by the act of eighteenth August, eighteen hundred and fifty-six, for inspection and transportation purposes | 30,000 00 | |
| For fuel and quarters for officers of the army serving on light-house duty, the payment of which is no longer provided for by the quartermaster's department | 7,034 05 | |
| For compensation of two superintendents for the life-saving stations on the coasts of Long Island and New Jersey | 3,000 00 | |
| For compensation of fifty-four keepers of stations, at two hundred dollars each | 10,800 00 | |
| For contingencies for life-saving apparatus on the coast of the United States | 12,000 00 | |
| For the purchase of the best self-righting life-boats, to be placed at each of the twenty-eight life-saving stations on the coast of New Jersey | 6,440 00 | |
| For the purchase of the best life-boats, to be approved by the Treasury Department, for use on the coast of Long Island | 10,000 00 | |
| For procuring two additional improved metallic life-boats, a metallic life-car, and necessary harness, lines, and other suitable articles, to be used, under the direction of the Secretary of the Treasury, in saving life in case of marine disaster off Galveston station, Texas | 10,000 00 | |
| Amount carried forward | 1,377,758 47 | 34,402,822 24 |

## STATEMENT—Contin ued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $1,377,758 47 | $34,402,822 24 |
| SURVEY OF THE PUBLIC LANDS. | | |
| For surveying the public lands, (exclusive of California, Oregon, Washington, New Mexico, Kansas, Nebraska, and Utah,) including incidental expenses and island surveys in the interior, and all other special and difficult surveys demanding augmented rates, to be apportioned and applied to the several surveying districts according to the exigencies of the public service, including expenses of selecting swamp lands and the compensation and expenses to survey or to locate private land claims in Louisiana, in addition to the unexpended balances of all former appropriations | 40,000 00 | |
| For correcting erroneous and defective lines of public and private surveys in Illinois and Missouri, at a rate not exceeding six dollars per mile | 1,000 00 | |
| For surveying in Louisiana at augmented rates now authorized by law | 3,000 00 | |
| For surveying the public lands and private land claims in California, including office expenses incident to the survey of claims, and to be disbursed at the rates prescribed by law for the different kinds of work | 100,000 00 | |
| For continuing the survey of base, meridian, standard parallels, township and section lines in New Mexico | 25,000 00 | |
| For surveying such of the private claims in New Mexico as shall have been confirmed by Congress, including expenses incurred by the surveyor general in adjudicating the same | 15,000 00 | |
| For surveying the necessary base, meridian, standard parallels, township and section lines in Kansas and Nebraska, also outlines of Indian reservations | 100,000 00 | |
| For preparing the unfinished records of public and private surveys to be transferred to the State authorities, under the provisions of the act of twelfth June, eighteen hundred and forty, in those districts where the surveys are about being completed | 10,000 00 | |
| For resurveys and examinations of the surveys of the public lands in those States where the offices of the surveyors general have been or shall be closed, under the acts of the twelfth June, eighteen hundred and forty, and twenty-second January, eighteen hundred and fifty-three, including two thousand dollars for the salary of the clerk detailed to this special service in the General Land Office | 2,000 00 | |
| For collection of agricultural statistics, investigations for promoting agriculture and rural economy, and the procurement of cuttings and seeds | 60,000 00 | |
| For drawings to illustrate the mechanical report of the Commissioner of Patents for the year eighteen hundred and fifty-eight | 6,000 00 | |

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| **HOSPITAL FOR THE INSANE.** | | |
| For the support, clothing, and medical treatment of the insane of the District of Columbia, and of the army and navy at the asylum in said District | 24,500 00 | |
| For salaries and incidental expenses of the institution for the instruction of the deaf, dumb, and blind in the District of Columbia, authorized by the act approved May twenty-nine, eighteen hundred and fifty-eight | 3,000 00 | |
| For extension of stables and erection of sheds in connexion with the stock yard | 4,000 00 | |
| For heating and ventilating the entire unfinished remainder of the hospital edifice, and for slightly remodelling the heating apparatus of the present finished portions of the building, so that the heating and ventilation of the whole establishment shall be one connected and efficient system | 15,000 00 | |
| For support, care, and medical treatment of forty transient paupers, medical and surgical patients in Washington Infirmary | 6,000 00 | |
| For purchase of manure for the public grounds | 1,000 00 | |
| For hire of carts on the public grounds | 1,695 50 | |
| For purchase and repair of tools used in the public grounds | 500 00 | |
| For purchase of trees and tree-boxes, to replace where necessary such as have been planted by the United States, and the repair of pavements in front of the public grounds | 5,000 00 | |
| For annual repairs of the Capitol, water-closets, public stables, water pipes, pavements, and other walks within the Capitol square, broken glass and locks | 6,000 00 | |
| To enable the Commissioner of Public Buildings to fit up with shelves the two rooms at the south end of the library of Congress for the use of the library, and for putting up a partition in the passage to them | 270 00 | |
| For annual repairs of the President's house and furniture, improvement of grounds, purchasing trees and plants for garden, and making hot-beds therein, and contingent expenses incident thereto | 12,000 00 | |
| For fuel, in part, of the President's house | 1,800 00 | |
| For lighting the President's house and Capitol, the public grounds around them, and around the executive offices, and Pennsylvania avenue, and Bridge and High streets, in Georgetown | 43,000 00 | |
| For erecting thirty additional lamp-posts in Bridge and High streets, in Georgetown | 810 00 | |
| For purchase of books for the library at the Executive mansion, to be expended under the direction of the President of the United States | 250 00 | |
| For repairs of the Potomac navy yard, and upper bridges | 6,000 00 | |
| For repairs of Pennsylvania avenue | 3,000 00 | |
| To pay the residue of the salary due the engineer for constructing the bridge across the Potomac at Little Falls | 2,589 67 | |
| For painting the hand rails and iron work of said bridge | 400 00 | |
| For public reservation number two, Lafayette square | 3,000 00 | |
| For taking care of the grounds south of the President's house, and keeping them in order | 1,000 00 | |
| For the payment of laborers employed in shovelling snow from the walks to and around the Capitol, the President's house, and the pavements along the government reservations on Pennsylvania avenue | 800 00 | |
| For repairs of water pipes | 500 00 | |
| Amount carried forward | 1,881,273 64 | 34,402,822 24 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $1,881,273 64 | $34,402,822 24 |
| For repairs of the furnaces under the Senate chamber and Supreme Court room | 1,000 00 | |
| For casual repairs of the Patent Office building | 3,000 00 | |
| For completing the west wing of the Patent Office building, filling up the southwest corner of the square, setting the curb, and raising Ninth street, in front of the building, to its proper grade | 50,000 00 | |
| For repairing the fence around that portion of the Mall upon which the Smithsonian Institution is situated | 1,000 00 | |
| For cleaning out the sewer traps on Pennsylvania avenue | 300 00 | |
| For purchasing plants for the conservatory at the President's house | 1,000 00 | |
| For the completion of the Washington aqueduct, in addition to so much of the appropriation of two hundred and fifty thousand dollars "for paying existing liabilities for the Washington aqueduct, and preserving the work already done from injury," contained in the act entitled "An act making appropriations for ceertain civil expenses of the government for the year ending the thirtieth June, eighteen hundred and fifty-seven," approved eighteenth August, eighteen hundred and fifty-six, as may not be required for said purposes | 800,000 00 | |
| For United States Capitol extension | 750,000 00 | |
| For extension of the General Post Office | 100,000 00 | |
| For binding two thousand four hundred copies Code of the District of Columbia, at seventy-five cents per copy, authorized by act approved third March, eighteen hundred and fifty-five | 1,875 00 | |
| For defraying the expenses of a certain party of Omaha Indians who visited the city of Washington during the months of February and March, eighteen hundred and fifty-two, to be expended under the direction of the Secretary of the Interior | 335 00 | |
| For continuing the extension of the Treasury building | 500,000 00 | |
| For continuing the work on the custom-house at New Orleans, Louisiana | 250,000 00 | |
| For continuing the work on the custom-house at Charleston, South Carolina | 200,000 00 | |
| For the completion of custom-houses at the following places, viz: | | |
| At Ellsworth, Maine | 2,000 00 | |
| At Portsmouth, New Hampshire | 50,000 00 | |
| At Bristol, Rhode Island, including fencing and grading | 5,000 00 | |
| At New Haven, Connecticut | 60,000 00 | |
| At Oswego, New York | 10,000 00 | |
| At Plattsburg, New York | 10,000 00 | |
| At Newark, New Jersey | 10,000 00 | |

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| **LIGHT-HOUSE ESTABLISHMENT.** | | |
| For the Atlantic, Gulf, and lake coasts, viz: | | |
| For supplying five hundred and fifty-six light-houses and beacon lights with oil, glass chimneys, wicks, chamois skins, polishing powder, whiting, and cleaning materials, transportation and other necessary expenses of the same, repairing and keeping in repair the lighting apparatus | 138,724 45 | |
| For repairs and incidental expenses, refitting and improvements of all the light-houses and buildings connected therewith | 173,289 21 | |
| For salaries of six hundred and eleven keepers of light-houses and light-beacons and their assistants | 60,000 00 | |
| For salaries of fifty-two keepers of light-vessels | 20,206 57 | |
| For seamen's wages, repairs, supplies, and incidental expenses of fifty-two light-vessels | 185,199 50 | |
| For expenses of raising, cleaning, painting, repairing, remooring, and supplying losses of buoys and day beacons, and for chains and sinkers for the same, and for coloring and numbering all the buoys | 82,228 78 | |
| **FOR THE COASTS OF CALIFORNIA, OREGON, AND WASHINGTON.** | | |
| For oil and other supplies for twenty-four lights, cleaning materials of all kinds, and transportation of the same, expenses of keeping lamps and machinery in repair, publishing notices to mariners of changes of aids to navigation | 1,472 91 | |
| For repairs and incidental expenses of twenty-four lights, and buildings connected therewith | 24,563 00 | |
| For maintenance of the vessel provided for by the act of eighteenth August, eighteen hundred and fifty-six, for inspection and transportation purposes | 30,000 00 | |
| For fuel and quarters for officers of the army serving on light-house duty, the payment of which is no longer provided for by the quartermaster's department | 7,034 05 | |
| For compensation of two superintendents for the life-saving stations on the coasts of Long Island and New Jersey | 3,000 00 | |
| For compensation of fifty-four keepers of stations, at two hundred dollars each | 10,800 00 | |
| For contingencies for life-saving apparatus on the coast of the United States | 12,000 00 | |
| For the purchase of the best self-righting life-boats, to be placed at each of the twenty-eight life-saving stations on the coast of New Jersey | 6,440 00 | |
| For the purchase of the best life-boats, to be approved by the Treasury Department, for use on the coast of Long Island | 10,000 00 | |
| For procuring two additional improved metallic life-boats, a metallic life-car, and necessary harness, lines, and other suitable articles, to be used, under the direction of the Secretary of the Treasury, in saving life in case of marine disaster off Galveston station, Texas | 10,000 00 | |
| Amount carried forward | 1,377,758 47 | 34,402,822 24 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $5,086,483 64 | $34,402,822 24 |
| At Galena, Illinois | 3,800 00 | |
| At Burlington, Iowa | 4,100 00 | |
| To enable the Library Committee to complete the payments for a series of portraits of the Presidents of the United States, contracted for under authority of Congress, and for framing the same | 5,000 00 | |
| For paying the expenses of the commissioners appointed in pursuance of the joint resolution of the twenty-sixth of February, eighteen hundred and fifty-seven, to inquire into and test the process of J. T. Barclay for preventing the counterfeiting the coins of the United States, in addition to the sum appropriated by said resolution | 800 00 | |
| For printing ordered by the Senate and House of Representatives during the thirty-third and thirty-fourth Congresses, and paper for the same | 80,000 00 | |
| For binding documents ordered to be printed by the House of Representatives during the thirty-third and thirty-fourth Congresses, and for engravings, lithographs, and electrotypes for the same | 123,000 00 | |
| For binding documents ordered to be printed by the Senate during the thirty-third and thirty-fourth Congresses, and for engravings, lithographs, and electrotypes for the same | 113,000 00 | |
| To enable the Secretary of the Interior to complete the digest of the statistics of manufactures according to the returns of the seventh census | 3,500 00 | |
| For making the necessary repairs to the jail in Washington city, and putting venitian blinds to the windows | 840 00 | |
| To pay the draughtsman employed by the Committees on Public Buildings and Grounds of the two houses of Congress, for drawings and calculations furnished, and incidental expenses defrayed by him during the last and present session of Congress | 528 00 | |
| For satisfying the claims of the States of Maine and Massachusetts, under the stipulation of the treaty between the United States and Great Britain, concluded on the ninth day of August, in the year eighteen hundred and forty-two: | | |
| For the satisfaction of such claims of the State of Maine | 11,496 81 | |
| For the satisfaction of like claims of the State of Massachusetts | 9,215 13 | |
| For defraying the expense of carrying into execution the joint resolution, approved May eleven, eighteen hundred and fifty-eight, "authorizing suitable acknowledgments to be made by the President to the British naval authorities at Jamaica for the relief extended to the officers and crew of the United States ship Susquehanna, disabled by yellow fever" | 3,000 00 | |
| For the payment of three companies of volunteers called into the service of the United States, in the Territory of Kansas, in eighteen hundred and fifty-six, by the order of the governor of that Territory | 8,668 14 | |

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| For the contingent expenses of the Senate, viz: | | |
| For miscellaneous items, and paying fees of witnesses before committees of the Senate | 7,700 00 | |
| To John B. Mutty, for compensation as acting secretary of the Territory of Nebraska during the vacancy created by the death of T. B. Cummings | 316 35 | |
| For lithographing and engraving ordered by the Senate during the present session | 45,000 00 | |
| For binding documents ordered to be printed by the Senate during the present session | 40,000 00 | |
| To supply a deficiency in the appropriation for legislative and contingent expenses of Washington Territory for the fiscal year ending June thirty, eighteen hundred and fifty-seven | 7,500 00 | |
| To enable the Secretary of the Treasury to employ in the office of the Register of the Treasury an additional clerk of the third class, and in the office of the Treasurer of the United States an additional clerk of the third class | 3,200 00 | |
| To enable the proper accounting officers of the Treasury to ascertain as among the expenditures of the State of Maine, in defending the territory heretofore in dispute with Great Britain, the amounts paid in borrowing money for those expenditures beyond the rate of six per centum per annum, whether in the form of discounts or otherwise, in all cases in which the principal of such expenditures, and interest upon them, at the rate of six per centum, have heretofore been refunded to said State by the United States | Indefinite. | |
| To enable the Secretary of State to adjust, upon principles of equity and justice, the accounts of I. D. Andrews, late agent of the United States, for expenses and disbursements in connexion with the reciprocity treaty. | Indefinite. | |
| To enable the Secretary of the Senate and Clerk of the House of Representatives to continue, down to the fourth of March, eighteen hundred and fifty-nine, the compilation of the congressional documents published by Congress, under the name of the "American State Papers," in the same manner as the first series thereof, under the authority of the act of Congress of March two, eighteen hundred and thirty-one, and the joint resolution of Congress of March two, eighteen hundred and thirty-three. and with the same particular index to each class, and a general index to the work; and to contract with Gales & Seaton, the publishers of the first series thereof, for publishing the same, not to exceed two thousand copies in number, at a price per volume not exceeding that paid for the first series, to be delivered to the Secretary of the Interior as the same may be published | 340,000 00 | 5,897,148 07 |
| *By the act making supplemental appropriations for the current and contingent expenses of the Indian department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June thirtieth, eighteen hundred and fifty-nine.* | | |
| CALAPOOIAS, MOLALLA, AND CLACKAMAS INDIANS OF WILLAMETTE VALLEY. | | |
| For fourth of five instalments for pay of physician, teacher, blacksmith, and farmer, per third article treaty twenty-second January, eighteen hundred and fifty-five | 3,440 00 | |
| Amount carried forward | 3,440 00 | 40,299,970 31 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $3,440 00 | $40,299,970 31 |
| NISQUALLY, PUYALLUP, AND OTHER TRIBES AND BANDS OF INDIANS. | | |
| For fulfilling the articles negotiated twenty-sixty December, eighteen hundred and fifty-four, with certain bands of Indians of Puget's Sound, Washington Territory: | | |
| For fourth of twenty instalments for pay of instructor, smith, physician, carpenter, farmer, and assistants, if necessary, per tenth article treaty twenty-sixth December, eighteen hundred and fifty-four | 2,200 00 | |
| CHASTA, SCOTON, AND UMPQUA INDIANS. | | |
| For fourth of fifteen instalments for the pay of a farmer, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 400 00 | |
| For fourth of ten instalments for pay of physician, medicines, and expense of care of the sick, per fifth article treaty eighteenth November, eighteen hundred and fifty four | 440 00 | |
| UMPQUAS AND CALAPOOIAS, OF UMPQUA VALLEY, OREGON. | | |
| For fourth of ten instalments for the pay of a blacksmith, and furnishing shop, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 440 00 | |
| For fourth of fifteen instalments for the pay of a physician and purchase of medicines, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 1,000 00 | |
| For fourth of ten instalments for the pay of a farmer, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 400 00 | |
| For fourth of twenty instalments for the pay of a teacher, and purchase of books and stationery, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 750 00 | |
| For the general incidental expenses of the Indian service in the Territory of Oregon, including insurance and transportation of annuities, goods, and presents, and office and travelling expenses of the superintendent, agents, and sub-agents | 39,500 00 | |
| For adjusting difficulties and preventing outbreaks among the Indians in the Territory of Oregon | 10,000 00 | |
| For defraying the expenses of the removal and subsistence of Indians in Oregon Territory to the reservations therein, aiding them in procuring their own subsistence, purchase of provisions and presents, compensation of laborers and other employés | 111,000 00 | |

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| For the general incidental expenses of the Indian service in the Territory of Washington, including insurance and transportation of annuities, goods, and presents, and office and travelling expenses of the superintendent, agents, and sub-agents | 36,000 00 | |
| For adjusting difficulties and preventing outbreaks among the Indians in Washington Territory | 12,500 00 | |
| For defraying the expenses of the removal and subsistence of the Indians in Washington Territory to the reservations therein, aiding them in procuring their own subsistence, purchase of provisions and presents, and compensation of laborers and other employés | 61,500 00 | |
| For the general incidental expenses of the Indian service in California, including travelling expenses of the superintendent, agent, and sub-agent | 15,000 00 | |
| For defraying the expenses of the removal and subsistence of Indians of California to the reservations in that State, and for pay of physicians, smiths, mechanics, and laborers at the reservations | 162,000 00 | |
| For the general incidental expenses of the Indian service in New Mexico, presents of goods, agricultural implements, and other useful articles, and to assist them to locate in permanent abodes and sustain themselves by the pursuits of civilized life, to be expended under the direction of the Secretary of the Interior | 75,000 00 | |
| For the compensation of three special agents and three interpreters for the Indian tribes of Texas, and for purchase of presents | 15,000 00 | |
| For the expenses of colonizing, supporting, and furnishing agricultural implements and stock for the Indians in Texas | 50,000 00 | |
| For the maintenance of a school at Brazos agency, pay of a teacher, and purchase of books | 1,500 00 | |
| For the general incidental expenses of the Indian service in the Territory of Utah, presents of goods, agricultural implements, and other useful articles, including travelling expenses of the superintendent, agents, and clerk hire | 55,000 00 | |
| **CREEKS.** | | |
| For payment in goods to the Creek Indians for damages on their annuity goods, wrecked in the steamer Governor Meigs, in December, eighteen hundred and fifty-four | 1,995 25 | |
| **SEMINOLES.** | | |
| For payment to the Seminoles for damages on their annuity goods. wrecked in the steamer Governor Meigs, in December, eighteen hundred and fifty-four | 332 11 | |
| For reimbursement to W. J. Cullen, superintendent of Indian affairs for the northern superintendency, for expenditures made by him in the recovery of five thousand dollars of the public funds stolen from Fort Ridgely | 650 00 | |
| Amount carried forward | 656,047 36 | 49,299,970 31 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $3,440 00 | $40,299,970 31 |
| NISQUALLY, PUYALLUP, AND OTHER TRIBES AND BANDS OF INDIANS. | | |
| For fulfilling the articles negotiated twenty-sixty December, eighteen hundred and fifty-four, with certain bands of Indians of Puget's Sound, Washington Territory: | | |
| For fourth of twenty instalments for pay of instructor, smith, physician, carpenter, farmer, and assistants, if necessary, per tenth article treaty twenty-sixth December, eighteen hundred and fifty-four | 2,200 00 | |
| CHASTA, SCOTON, AND UMPQUA INDIANS. | | |
| For fourth of fifteen instalments for the pay of a farmer, per fifth article treaty eighteenth November, eighteen hundred and fifty-four | 400 00 | |
| For fourth of ten instalments for pay of physician, medicines, and expense of care of the sick, per fifth article treaty eighteenth November, eighteen hundred and fifty four | 440 00 | |
| UMPQUAS AND CALAPOOIAS, OF UMPQUA VALLEY, OREGON. | | |
| For fourth of ten instalments for the pay of a blacksmith, and furnishing shop, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 440 00 | |
| For fourth of fifteen instalments for the pay of a physician and purchase of medicines, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 1,000 00 | |
| For fourth of ten instalments for the pay of a farmer, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 400 00 | |
| For fourth of twenty instalments for the pay of a teacher, and purchase of books and stationery, per sixth article treaty twenty-ninth November, eighteen hundred and fifty-four | 750 00 | |
| For the general incidental expenses of the Indian service in the Territory of Oregon, including insurance and transportation of annuities, goods, and presents, and office and travelling expenses of the superintendent, agents, and sub-agents | 39,500 00 | |
| For adjusting difficulties and preventing outbreaks among the Indians in the Territory of Oregon | 10,000 00 | |
| For defraying the expenses of the removal and subsistence of Indians in Oregon Territory to the reservations therein, aiding them in procuring their own subsistence, purchase of provisions and presents, compensation of laborers and other employés | 111,000 00 | |

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| **WINNEBAGOES.** | | |
| For payment to Baptiste Lassallier, a Winnebago half-breed, for this amount, to which he is entitled under the fourth article of the treaty with the Winnebagoes of the first November, eighteen hundred and thirty seven, four hundred dollars, with interest thereon from the date of unauthorized payment to John H. Kinzie, in eighteen hundred and thirty-eight, at six per centum | 880 00 | |
| To enable the Secretary of the Interior to perform the engagements and stipulations of General Harney made with the Sioux Indians at Fort Pierre in eighteen hundred and fifty-six | 72,000 00 | |
| To enable the Secretary of the Interior to adjust differences and preserve peace with the Cut-head and Yanctonaise bands of Sioux Indians | 25,000 00 | |
| For compensation of five extra clerks employed in the Indian Office under the act of fifth August, eighteen hundred and fifty-four, and third of March, eighteen hundred and fifty-five, and under appropriations made from year to year | 7,000 00 | |
| **PAWNEES.** | | |
| For fulfilling the stipulations in the treaty with the Pawnees of the twenty-fourth of September, eighteen hundred and fifty-seven: | | |
| For first of five instalments in goods and such articles as may be necessary for them, per second article of said treaty | 40,000 00 | |
| For support of two manual labor schools, during the pleasure of the President, per third article of said treaty | 10,000 00 | |
| For pay of two teachers, per third article | 1,200 00 | |
| For erection of houses for teachers, per third article | 1,000 00 | |
| For two complete sets of blacksmith, gunsmith, and tinsmiths' tools, per fourth article | 750 00 | |
| For erection of shops for smiths, per fourth article | 500 00 | |
| For purchase of iron, steel, and other necessaries for same, during the pleasure of the President, per fourth article | 560 00 | |
| For pay of two blacksmiths, one of whom to be a gunsmith and tinsmith, per fourth article | 1,200 00 | |
| For compensation of two strikers or apprentices in shops, per fourth article | 480 00 | |
| For first of ten instalments for farming utensils and stock, during the pleasure of the President, per fourth article | 1,200 00 | |
| For the first year's purchase of stock, and for erecting shelters for the same, per fourth article | 3,000 00 | |
| For pay of a farmer, per fourth article | 600 00 | |
| For the erection of a steam grist and saw mill, per fourth article | 6,000 00 | |
| For first of ten instalments for pay of miller, at the discretion of the President, per fourth article | 600 00 | |
| For first of ten instalments for pay of an engineer, at the discretion of the President, per fourth article | 1,200 00 | |
| For compensation to apprentices to assist in working the mill, per fourth article | 500 00 | |
| Amount carried forward | 941,457 36 | 49,299,970 31 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $941,457 36 | $40,299,970 31 |
| For the erection of dwelling-houses for the interpreter, blacksmiths, farmer, miller, and engineer, (five hundred dollars each,) per fourth article | 3,000 00 | |
| For the first of three instalments for the pay of six laborers, per seventh article | 3,000 00 | |
| For payment to Samuel Allis, in remuneration for his services and for losses sustained by him, per tenth article | 1,000 00 | |
| For payment to Ta-ra-da-ka-wa, head chief of the Tappahs band, and four other Pawnees, for their services as guides, and for losses sustained by them, (one hundred dollars each,) per eleventh article | 500 00 | |
| To enable the Pawnees to settle any just claims existing against them, per twelfth article | 10,000 00 | |
| For surveying the exterior lines of the reservation provided for in the first article | 1,000 00 | |
| | | 959,957 36 |
| *By the act making appropriations for the support of the army for the year ending the thirtieth June, eighteen hundred and fifty-nine.* | | |
| For expenses of recruiting, transportation of recruits, three months' extra pay to non-commissioned officers, musicians, and privates, on re-enlistment | 110,000 00 | |
| For pay of the army | 3,591,784 00 | |
| For commutation of officers' subsistence | 998,434 50 | |
| For commutation of forage for officers' horses | 124,128 00 | |
| For payments to discharged soldiers for clothing not drawn | 50,000 00 | |
| For payments in lieu of clothing for officers' servants | 39,890 00 | |
| For subsistence in kind | 1,380,652 65 | |
| For clothing for the army, camp, and garrison equipage | 1,062,702 99 | |
| For the regular supplies of the quartermaster's department, consisting of fuel for the officers, enlisted men, guards, hospitals, storehouses, and offices; of forage in kind for the horses, mules, and oxen, of the quartermaster's department at the several posts and stations, and with the armies in the field; for the horses of the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, the companies of light artillery, and such companies of infantry as may be mounted, and for the authorized number of officers' horses when serving in the field and at the outposts, including bedding for the animals; of straw for soldiers' bedding, and of stationery, including company and other blank books for the army, certificates for discharged soldiers, blank forms for the pay and quartermaster's departments; and for the printing of division and department orders, army regulations, and reports | 1,745,000 00 | |

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| For the incidental expenses of the quartermaster's department, consisting of postage on letters and packets received and sent by the officers of the army on public service; expenses of courts martial and courts of inquiry, including the additional compensation of judge advocates, recorders, members, and witnesses, while on that service, under the act of March, sixteenth, eighteen hundred and two; extra pay to soldiers employed under the direction of the quartermaster's department, in the erection of barracks, quarters, storehouses, and hospitals; in the construction of roads, and on other constant labor for periods of not less than ten days, under the acts of March second, eighteen hundred and nineteen, and August fourth, eighteen hundred and fifty-four, including those employed as clerks at division and department headquarters; expenses of expresses to and from the frontier posts and armies in the field; of escorts to paymasters and other disbursing officers, and to trains, where military escorts cannot be furnished; expense of the interment of officers killed in action, or who die when on duty in the field, or at the posts on the frontiers, and of non-commissioned officers and soldiers; authorized office furniture; hire of laborers in the quartermaster's department; compensation of forage and wagon masters, authorized by the act of July fifth, eighteen hundred and thirty-eight; for the apprehension of deserters, and the expenses incident to their pursuit; the following expenditures required for the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, and such companies of infantry as may be mounted, viz: the purchase of portable forges, blacksmiths' and shoeing tools, horse and mule shoes and nails, iron and steel for shoeing, hire of veterinary surgeons, medicines for horses and mules, picket ropes, and shoeing the horses of those corps | 500,000 00 | |
| For constructing barracks and other buildings at posts which it may be necessary to occupy during the year; and for repairing, altering, and enlarging buildings at the established posts, including hire or commutation of quarters for officers on military duty; hire of quarters for troops, of storehouses for the safe keeping of military stores, and of grounds for summer cantonments, and for temporary frontier stations | 790,000 00 | |
| For the repairs of the barracks at Baton Rouge, Louisiana, to be expended under the direction of the Secretary of War | 25,000 00 | |
| For mileage, or the allowance made to officers of the army for the transportation of themselves and their baggage when travelling on duty without troops, escorts, or supplies | 130,000 00 | |
| For transportation of the army, including the baggage of the troops, when moving either by land or water; of clothing, camp and garrison equipage, from the depot at Philadelphia to the several posts and army depots; of horse equipments, and of subsistence from the places of purchase, and from the places of delivery under contract, to such places as the circumstances of the service may require them to be sent; of ordnance, ordnance stores, and small arms, from the foundries and armories to the arsenals, fortifications, frontier posts, and army depots; freights, wharfage, tolls, and ferriages; for the purchase and hire of horses, mules, and oxen, and the purchase and repair of wagons, carts, drays, ships, and other seagoing vessels and boats required for the transportation of supplies and garrison purposes; for drayage and cartage at the several posts; hire of teamsters; transportation of funds for the pay and other disbursing departments; the expense of sailing public transports on the various rivers, the Gulf of Mexico, and the | | |
| Amount carried forward | 10,547,592 14 | 41,259,927 67 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | $10,547,592 14 | $41,259,927 67 |
| Atlantic and Pacific; and for procuring water at such posts as, from their situation, require that it be brought from a distance; and for clearing roads, and removing obstructions from roads, harbors, and rivers, to the extent which may be required for the actual operations of the troops on the frontier | 3,400,000 00 | |
| For the purchase of horses for the two regiments of dragoons, the two regiments of cavalry, the regiment of mounted riflemen, and the companies of light artillery | 200,000 00 | |
| For contingencies of the army | 25,000 00 | |
| For the medical and hospital departments | 105,000 00 | |
| For contingent expenses of the adjutant general's department at division and department headquarters | 500 00 | |
| For compensation of the clerk and messenger in the office of the commanding general | 2,000 00 | |
| For contingent expenses of the office of the commanding general | 300 00 | |
| For armament of fortifications | 300,000 00 | |
| For ordnance, ordnance stores, and supplies, including horse equipments for the mounted regiments | 250,000 00 | |
| For the current expenses of the ordnance service, including experiments in the manufacture of cannon and cannon powder, and for tests of arms and ammunition, not otherwise provided for | 150,000 00 | |
| For the purchase of gunpowder for the land service | 100,000 00 | |
| For the manufacture of arms at the national armories | 400,000 00 | |
| For the purchase of breech-loading carbines of the best model, to be selected and approved by a board of ordnance officers | 25,000 00 | |
| For the alteration of old arms so as to make them breech-loading arms, upon a model to be selected and approved by the board of ordnance officers | 25,000 00 | |
| For the Allegheny arsenal | 35,100 00 | |
| For Fort Monroe arsenal | 24,900 00 | |
| For Kennebec arsenal | 11,600 00 | |
| For St. Louis arsenal | 31,000 00 | |
| For Washington arsenal | 9,379 00 | |
| For an additional timber and carriage storehouse at the North Carolina arsenal | 25,000 00 | |
| For Watervliet arsenal | 30,000 00 | |
| For repairs and preservation of the public buildings, fences, drains, culverts, and so forth, at all the smaller arsenals | 20,000 00 | |
| For continuing the construction of the arsenal in California | 100,000 00 | |
| For contingencies of arsenals | 10,000 00 | |

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| For repairing the arsenal and two eighteen-pound gun-carriages, at Stonington, Connecticut | 750 00 | |
| For repairs and improvements and new machinery at Springfield armory, Massachusetts | 55,227 00 | |
| For repairs and improvements and new machinery at Harper's Ferry | 101,907 00 | |
| For surveys for military defences, geographical explorations, and reconnaissances, for military purposes, and surveys with armies in the field | 95,000 00 | |
| For purchase and repairs of instruments | 15,000 00 | |
| For continuing the survey of the northern and northwestern lakes, including Lake Superior | 75,000 00 | |
| For printing charts of lake surveys | 10,000 00 | |
| To enable the Secretary of War to employ temporary clerks in the office of the quartermaster general, on bounty land service | 5,000 00 | |
| For the support of four companies of volunteers mustered into the service of the United States, at Camp Scott, Utah Territory, in October, November, and December, eighteen hundred and fifty-seven | 173,478 80 | |
| For continuing the construction of the following works of defence: | | |
| Fort at Hog Island ledge, in Portland harbor, Maine | 40,000 00 | |
| Fort Richmond, Staten island, New York harbor, New York | 75,000 00 | |
| Fort Delaware, Delaware river, Delaware | 75,000 00 | |
| Fort Carroll, Sollers' Point flats, Baltimore harbor, Maryland | 75,000 00 | |
| Fort Taylor, Key West, Florida | 75,000 00 | |
| Fort Jefferson, Garden Key, Tortugas, Florida | 150,000 00 | |
| Fort Point, San Francisco, California | 112,500 00 | |
| For contingent expenses of fortifications, preservation of sites, protection of titles, and repairs of sudden damage | 30,000 00 | |
| For construction of permanent platforms for modern cannon of large calibre in existing fortifications of important harbors | 30,000 00 | |
| For the payment of claims favorably reported upon by the board of army officers (appointed under the sixth section of the act approved August thirty-first, eighteen hundred and fifty-two) in their final report to Congress, dated April nineteenth, eighteen hundred and fifty-five | 7,872 52⅓ | |
| For the construction of bridges and the improvement of the crossings of streams on the road from Fort Smith, in Arkansas, to Albuquerque, in New Mexico | 50,000 00 | |
| For completing connected sections of the road extending from Albuquerque, in the Territory of New Mexico, westward, on the route to the Colorado river, on or near the thirty-fifth parallel of north latitude | 100,000 00 | |
| For preparing the drawings of the sailing charts of the Behring's Strait and North Pacific exploring and surveying expedition, under the control and direction of the Secretary of the Navy | 6,700 00 | |
| | | 17,185,806 46 |
| *By the act making appropriations for the expenses of collecting the revenue from customs.* | | |
| For the expenses of collecting the revenue from customs, together with such sums as may be received from storage, cartage, drayage, and labor | | 3,600,000 00 |
| Amount carried forward | | 62,045,734 13 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $62,045,734 13 |
| *By the act making an appropriation for the completion of the military road from Astoria to Salem, in Oregon Territory.* | | |
| For the completion of the military road from Astoria to Salem, to be completed under the direction of the Secretary of War | | 30,000 00 |
| *By the act to supply an omission in the enrolment of a certain act therein named.* | | |
| For the manufacture of arms at the national armories | | 360,000 00 |
| *By the act to supply deficiencies in the appropriations for the current and contingent expenses of the Indian Department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June thirtieth, eighteen hundred and fifty-eight.* | | |
| For restoring and maintaining, by peaceable measures, friendly relations with the Indian tribes in Oregon Territory, or so much thereof as may be necessary for expenditure during the year ending thirtieth of June, eighteen hundred and fifty-eight | $264,000 00 | |
| For payment to such Cherokees as were omitted in the census taken by D. W. Siler, but who were included and paid under the act of July, eighteen hundred and forty-eight, the same per capita allowance that was paid the other Indians under that distribution, provided the Commissioner of Indian Affairs shall be satisfied they ought to be included in said per capita distribution | 3,278 32 | |
| For contingencies of the Indian Department during the year ending June thirtieth, eighteen hundred and fifty-eight | 25,000 00 | |
| For indemnity to George W. Stidham, a Creek Indian, for property stolen from him and injured by a citizen of the United States | 125 00 | |
| For general incidental expenses of the Indian service in the Territory of Washington during the year ending June thirtieth, eighteen hundred and fifty-eight | 16,000 00 | |
| SENECAS OF NEW YORK. | | |
| For interest, in lieu of investment, on seventy-five thousand dollars, at five per centum, per act of twenty-seventh June, eighteen hundred and forty-six | 3,000 00 | |

| | | |
|---|---|---|
| For payment of the difference in salaries of the agents for the Sioux and Seminole Indians, for the Omaha agency, for the Kickapoo agency, for the Kansas agency, and for the Neosho agency, between the rates as fixed previous to the act of third March, eighteen hundred and fifty-seven, and the rate authorized by said act from the third March, eighteen hundred and fifty-seven, to the thirtieth June, eighteen hundred and fifty-eight | 3,991 68 | |
| For compensation of one clerk in the Indian Office, employed to enable the Secretary of the Interior to carry out the regulations prescribed to give effect to the seventh section of the act of third March, eighteen hundred and fifty-five, granting bounty lands to Indians | 1,400 00 | |
| For compensation of two extra clerks, employed to carry out the treaty with the Chickasaws in the adjustment of their claims | 2,800 00 | |
| For defraying the expenses of the several expeditions against Ink-pa-du-tah's band, and in the search, ransom, and recovery of the female captives taken by said band in eighteen hundred and fifty-seven | 20,000 00 | |
| | | 339,595 00 |
| *By the act to authorize a loan not exceeding the sum of twenty millions of dollars.* | | |
| To defray the expense of engraving and printing certificates of such stock and other expenses incident to the execution of this act | | 5,000 00 |
| *By the act making appropriations for the transportation of the United States mail by ocean steamers, and otherwise, during the fiscal year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For transportation of the mails from New York to Liverpool, and back | 346,500 00 | |
| For transportation of the mails from New York to New Orleans, Charleston, Savannah, Havana, and Chagres, and back | 261,000 00 | |
| For transportation of the mails from Panama to California and Oregon, and back | 328,350 00 | |
| For transportation of the mails between San Francisco, California, and Olympia, Washington Territory | 122,500 00 | |
| For transportation of the mails on Puget's Sound | 22,400 00 | |
| For transportation of the mails from New York, by Southampton or Cowes, to Havre | 230,000 00 | |
| For transportation of the mails between Charleston and Havana | 50,000 00 | |
| For transportation of the mails across the Isthmus of Panama | 100,000 00 | |
| To enable the Postmaster General to cause the mails to be transported between the United States and any foreign port or ports, by steamship, allowing and paying therefor, if by an American vessel, the sea and United States inland postage, and, if by a foreign vessel, the sea postage only, on the mails so conveyed | Indefinite. | |
| | | 1,460,750 00 |
| Amount carried forward | | 64,241,079 13 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $64,241,079 13 |
| *By the act making appropriations for the service of the Post Office Department during the fiscal year ending the thirtieth of June, eighteen hundred and fifty-nine.* | | |
| For transportation of the mails, (inland) | $10,140,520 00 | |
| For compensation to postmasters | 2,325,000 00 | |
| For ship, steamboat, and way letters | 20,000 00 | |
| For wrapping paper | 55,000 00 | |
| For office furniture in the post offices | 5,000 00 | |
| For advertising | 85,000 00 | |
| For mail bags | 65,000 00 | |
| For blanks, and paper for the same | 125,000 00 | |
| For mail locks, keys, and stamps | 15,000 00 | |
| For mail depredations and special agents | 70,000 00 | |
| For clerks in the offices of postmasters | 850,000 00 | |
| For postage stamps and stamped envelopes | 100,000 00 | |
| For miscellaneous items | 180,000 00 | |
| To supply deficiencies in the revenue of the Post Office Department for the year ending the thirtieth of June, eighteen hundred and fifty-nine | 3,500,000 00 | |
| | | 17,535,520 00 |
| *By the joint resolution making an appropriation for the payment of expenses of investigating committees of the House of Representatives.* | | |
| For the payment of expenses of the several investigating committees of the House of Representatives during the present session, and that the same shall be added to the miscellaneous item of the contingent fund of said House | | 35,000 00 |
| *By the resolution to authorize the Secretary of the Treasury to audit and settle the accounts of the contractor for the erection of the United States marine hospital at San Francisco, California.* | | |
| To settle and adjust the accounts of the contractor for the erection of the United States marine hospital at San Francisco, California, and to pay to said contractor the amount that may be found to be justly due to him under the contracts made between said contractor and the proper officers of the government in reference to said building | | Indefinite. |

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|---|---|---|
| *By the joint resolution for paying the compensation of stenographers employed by committees of the House of Representatives.* | | |
| The compensation of stenographers employed by the committees of the House of Representatives, as audited under the direction of said House | | Indefinite. |
| *By the joint resolution making appropriations to pay the expenses of the several investigating committees of the House of Representatives.* | | |
| For the payment of expenses of the several investigating committees, and of the Judiciary Committee of the House of Representatives, and that the same shall be added to the miscellaneous item of the contingent fund of said House | | 12,000 00 |
| *By the act for the relief of John Hamilton.* | | |
| In full compensation for his time and services, &c , during his imprisonment with the Indians in the war of eighteen hundred and twelve with Great Britain | | Indefinite. |
| *By the act for the relief of Doctor Charles D. Maxwell, a surgeon in the United States navy.* | | |
| The difference of pay between that of a passed assistant surgeon and a surgeon, from the twenty-second day of December, eighteen hundred and forty-five. to the seventh day of July, eighteen hundred and forty-eight, being the period during which he performed the duties of a surgeon and assistant surgeon on board the United States ship Cyane | | Indefinite. |
| *By the act for the relief of the owners of the barque Attica of Portland, Maine.* | | |
| For the amount imposed on said vessel as tonnage duty by the collector of New York, in the year of our Lord eighteen hundred and fifty-five | | 174 62 |
| *By the act for the relief of the heirs of Alexander Stevenson.* | | |
| The amount of money due to said Stevenson from the time of his enlistment, January 1, seventeen hundred and seventy-six, until the time of his discharge, in seventeen hundred and eighty-three | | 654 00 |
| *By the act for the relief of Duncan Robertson.* | | |
| For moneys paid by him to the navy yard at Gosport, it being the amount expended for repairs of the Norwegian barque Ellen, for damages encountered by said barque in aiding and rescuing the passengers of the steamer Central America | | 749 00 |
| Amount carried forward | | 81,825,176 75 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount carried forward | | $81,825,176 75 |
| *By the act for the relief of Captain James Mac McIntosh, of the United States navy.* | | |
| The difference between the sum paid to him at the treasury as commander "on other duty" and that which was due to him as such officer "attached to a vessel for sea service," and being in full for his services as an officer of the West India squadron from the fourteenth day of August, eighteen hundred and thirty-seven, to the third day of September, eighteen hundred and thirty-eight | | 204 95 |
| *By the act for the relief of Elijah F. Smith, Gilman H. Perkins, and Charles F. Smith.* | | |
| To refund to Elijah F. Smith, Gilman H. Perkins, and Charles F. Smith, or the survivors of them, composing the firm of Smith, Perkins and Company, of Rochester, New York, the amount paid by them to the United States on one debenture bond, executed by John B. Glover and Company, dated April second, eighteen hundred and fifty-seven, as penalty over and above the regular duties on the merchandise therein mentioned | | 837 00 |
| *By the act for the relief of George A. O'Brien.* | | |
| For his services as clerk in the office of the Second Auditor from the fifth of July, eighteen hundred and forty-five, to the third day of March, eighteen hundred and forty-six | | 549 33 |
| *By the act for the relief of the heirs of John B. Hand.* | | |
| To pay to the heirs of John B. Hand | | 1,340 00 |
| *By the act for the relief of Rufus Dwinel.* | | |
| For interest, at the rate of six per centum per annum, on the sum of thirteen thousand and thirty-seven dollars and seventy-two cents, from the fourth day of March, eighteen hundred and thirty-seven, when the latter sum was due from the United States to said Dwinel's assignor, to March eleventh, eighteen hundred and fifty-two, when an appropriation was made for its payment | | 11,748 03 |

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|---|---|---|
| *By the act for the relief of Jonas P. Keller.* | | |
| For his services as a watchman or overseer of the executive building at the corner of F and Seventeenth streets, from the first of April, eighteen hundred and forty-nine, to the thirtieth September, eighteen hundred and fifty | | 750 00 |
| *By the act for the relief of Susanna T. Lea, widow and administratrix of James Maglenen, late of the city of Baltimore, deceased.* | | |
| For the value of a horse and equipments belonging to the said James Maglenen, the same having been impressed in September, eighteen hundred and fourteen, for the purpose of sending an express to North Point, and the said horse and equipments having been lost in said service | | 130 00 |
| *By the act for the relief of J. Wilcox Jenkins.* | | |
| For the difference between the pay of captain's clerk and a purser of a first class sloop-of-war from the first day of January to the thirtieth of April, eighteen hundred and fifty-six, during which time he was the acting purser of the sloop-of-war Germantown | | Indefinite. |
| *By the act for the relief of William B. Trotter.* | | |
| For all demands of the said Trotter growing out of the emigration and subsistence of Choctaw Indians in the State of Mississippi, in the year eighteen hundred and thirty-one, under a contract with the United States | | 1,680 00 |
| *By the act for the relief of the heirs or legal representatives of Richard D. Rowland, deceased, and others.* | | |
| To pay to the heirs, executors, administrators, or legal representatives of Richard D. Rowland, deceased, late of Alabama, three thousand two hundred dollars, and to the heirs, executors, administrators, or legal representatives of whomsoever possesses whatever title the United States gave to Cureton, Smith, and Heifner, to the southeast quarter of section two, township fourteen, range eight east, of the lands selected in Alabama, and sold under treaty of March twenty-four, eighteen hundred and thirty-two, with the Creek Indians, for the benefit of the orphans of the tribe, two thousand two hundred and sixty dollars, with interest, at the rate of five and a half per cent. per annum, upon both aforesaid sums, from November first, eighteen hundred and thirty-six | | Indefinite. |
| Amount carried forward | | 81,842,416 06 |

## STATEMENT—Continued.

| Object of appropriation. | Amount | Total. |
|---|---|---|
| Amount brought forward | | $81,842,416 06 |
| *By the act for the relief of Samuel W. Turner and Alvin A. Turner.* | | |
| For their services in transporting the United States mail on their steamers from Cleveland, Ohio, and Detroit, Michigan, to Mackinaw, Sault Ste. Marie, Marquette, Copper Harbor, Eagle Harbor, Eagle River, and Ontonagon, Michigan, and La Pointe, Bayfield, and Superior City, in the State of Wisconsin | | 23,825 00 |
| *By the act for the relief of D. O. Dickinson.* | | |
| For services rendered by said Dickinson in connexion with keeping a light in Waukegan harbor, Illinois | | 108 75 |
| *By the act for the relief of Thomas Phenix, jr.* | | |
| To pay to Thomas Phenix, jr., during the time he was acting as paymaster's clerk in the employment of D. Randall, deputy paymaster general, the sum of three dollars a day; but from this compensation is to be deducted the salary of five hundred dollars per annum, already received by him | | Indefinite. |
| *By the act for the relief of Lewis W. Broadwell.* | | |
| For transporting the United States mails, in steamboats, from Vicksburg, Mississippi, to Grand Lake, Arkansas, from the fourth day of September, eighteen hundred and fifty-four, to the seventeenth day of April, eighteen hundred and fifty-seven, at the rate of five thousand dollars per annum | | 12,938 00 |
| *By the act for the relief of Benjamin L. McAtee and Isaac N. Eastham, of Louisville, Kentucky.* | | |
| For transporting extra mail matter over routes number three thousand nine hundred and sixty, and number four thousand one hundred and sixty-nine, between the first day of July, eighteen hundred and forty-six, and the 30th day of June, eighteen hundred and fifty | | 6,000 00 |
| *By the act for the relief of Benjamin Wakefield.* | | |
| For the difference of pay between that of master's mate and boatswain, from the first day of January, eighteen hundred and forty-eight, to the nineteenth day of January, eighteen hundred and fifty | | Indefinite. |

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|---|---|---|
| *By the act for the relief of Susannah Redman, widow of Lloyd Redman.* | | |
| For the amount adjudged as due to said Lloyd Redman for three horses lost by him while in the service of the United States during the Mexican war | | 170 00 |
| *By the act for the relief of Simeon Stedman.* | | |
| To pay to Simeon Stedman, who served in Captain Christopher Ripley's company of the thirty-seventh infantry during the war with Great Britain in eighteen hundred and twelve, such sum or sums as may have accrued to him from the time of his last receiving payment for services till the end of the war | | Indefinite. |
| *By the act for the relief of Oliver P. Hovey.* | | |
| For printing the "Kearny Code" of laws for New Mexico in eighteen hundred and forty-six | | 1,555 00 |
| *By the act for the relief of George W. Biscoe.* | | |
| For indemnification under the first article of the treaty of Ghent for the loss of the schooner "Speedwell," captured in the Patuxent river by the British naval forces on the twenty-second of August, eighteen hundred and fourteen, and which was in the waters and within the territorial jurisdiction of the United States on the seventeenth day of February, eighteen hundred and fifteen, the day of the exchange of the ratifications of the said treaty of Ghent, and was carried away out of the said waters and territorial jurisdiction of the United States, in violation of the said first article of the said treaty | | 2,000 00 |
| *By the act for the relief of Richard B. Alexander.* | | |
| For the value of one horse and one mule lost by him during the Mexican war | | 250 00 |
| *By the act for the relief of Robert W. Cushman, formerly an acting purser in the United States navy.* | | |
| To pay to Robert W. Cushman, acting purser of the Germantown, the flag ship of the African squadron, the difference of pay between that of a purser and a captain's clerk for such time as he so acted as purser | | Indefinite. |
| *By the act for the relief of William Heine, artist in the Japan expedition.* | | |
| To pay to William Heine, artist of the late Japan expedition under Commodore Perry, compensation at the rate of eighteen hundred dollars per annum during the time he was actually employed in such service | | Indefinite. |
| Amount carried forward | | 81,889,262 81 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $81,889,262 81 |
| *By the act for the relief of Alonzo and Elbridge G. Colby.* | | |
| For the balance due them on their contract with the United States, dated July twenty-four, eighteen hundred and fifty-five, for constructing a breakwater at Owl's Head harbor, Penobscot river, Maine | | 2,502 11 |
| *By the act for the relief of David McClure, administrator of Joseph McClure, deceased.* | | |
| For the amount of interest collected from the said Joseph McClure, in his lifetime, on a judgment in favor of the United States government, which it was afterwards ascertained the said McClure did not properly owe, and the amount of which judgment has been previously refunded to him by Congress | | 107 64 |
| *By the act for the relief of James Rumph.* | | |
| In full compensation for medical aid rendered to soldiers in the service of the United States in the year eighteen hundred and thirty-seven | | 760 00 |
| *By the act for the relief of John Dearmit.* | | |
| To pay to John Dearmit, in addition to the amount already paid him by the government under his contract for carrying the mail upon route number one thousand six hundred and one, from July first, eighteen hundred and forty-four, for four years | | 295 00 |
| *By the act for the relief of Stuckey and Rogers.* | | |
| To pay to Stuckey and Rogers, mail contractors on route number six thousand and seventy-eight, (6078,) from Winsboro' to Pinckneyville, in the State of South Carolina, at the rate of three hundred and thirty-three dollars per annum, for the transportation of the mails on said route; deducting therefrom whatever payments may have been made, at the rate of one hundred and thirty-eight dollars per annum, by the Post Office Department | | Indefinite. |

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|---|---|---|
| *By the act for the relief of Peter Parker.* | | |
| For his services as chargé d'affaires ad interim at Canton, in China, at various periods between the dates of May twenty-six, anno Domini eighteen hundred and fifty-two, and the fourth day of May, eighteen hundred and fifty-five | | 2,603 19 |
| *By the act for the relief of the legal representatives of Daniel Hay, deceased.* | | |
| To pay to the legal representatives of Daniel Hay, deceased, a sum equal to two per centum on all moneys disbursed by him as agent for paying pensions, from and after the twentieth day of April, eighteen hundred and thirty-six, with interest on the same, from the thirtieth of April, eighteen hundred and fifty-six | | Indefinite. |
| *By the act for the relief of Dr. Thomas Antisell.* | | |
| For services rendered as acting assistant surgeon to the command (company G, 3d artillery) escorting Lieutenant Parke's party of survey, from California to New Mexico, in the year eighteen hundred and fifty-five | | 274 65 |
| *By the act for the relief of the heirs of Richard Tarvin.* | | |
| For losses sustained by Richard Farren, or Richard Tarvin, during said war of eighteen hundred and thirteen and fourteen | | 600 00 |
| *By the act for the relief of Mrs. Harriet O. Reid, executrix of the late Brevet Colonel A. C. W. Fanning, of the United States army.* | | |
| To pay to Mrs. Harriet O. Reid, executrix of the late Brevet Colonel A. C. W. Fanning, of the United States army, the amount claimed to be due the estate of the said Brevet Colonel Fanning, as commissions of two and a half per cent. upon the sum of fifty thousand dollars disbursed by him in eighteen hundred and twenty-seven and eighteen hundred and twenty-eight, at the United States arsenal, in Augusta, Georgia | | 1,250 00 |
| *By the act for the relief of Gardner and Vincent, and others.* | | |
| To audit and settle the several accounts of Gardner and Vincent, A. S. Gardner, A. F. Holmes, G. B. Murphy, C. C. Carlton, N. E. Crittenden, O. A. Brooks and Company, and W. Bingham and Company, for goods, &c., furnished the United States marine hospital at Cleveland, Ohio, during the superintendency of John Coon | | Indefinite. |
| Amount carried forward | | 81,897,655 40 |

## STATEMENT—Continued.

| Object of appropriation. | Amount. | Total. |
|---|---|---|
| Amount brought forward | | $81,897,655 40 |
| *By the act for the relief of Jennett H. McCall, only child of Captain James McCall, of the revolutionary war.* | | |
| To pay to Jennett H. McCall, only child of Captain James McCall, of General Pickens' brigade, in the South Carolina regiment, during the war of the revolution, the seven years' half-pay of a captain, as allowed by the resolution of Congress passed August twenty-fourth, one thousand seven hundred and eighty | | 2,100 00 |
| *By the resolution for the benefit of the widow of Commander William Lewis Herndon, United States navy.* | | |
| To pay the widow of Commander William Lewis Herndon, a sum equal to three years' full sea-service pay of a commander in the navy | | Indefinite. |
| Total | | 81,899,755 40 |

RECAPITULATION.

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|---|---|
| Legislative, executive, judicial, civil, and miscellaneous | $12,871,576 42 |
| Diplomatic and consular | 912,120 00 |
| Indian Department, revolutionary, invalid, and other pensions | 3,407,156 85 |
| Army fortifications, Military Academy, and military roads | 25,683,610 46 |
| Naval service | 14,508,354 23 |
| Post Office Department | 19,047,456 00 |
| Ocean steam mail service | 1,460,750 00 |
| Collection of the revenue | 3,600,000 00 |
| Treaty with the King of Denmark | 408,731 44 |
| | 81,899,755 40 |

## II.—OFFICERS CREATED AND THE SALARIES THEREOF.

*By the act (Chap. 12) to create additional land districts in the State of California, and for other purposes.*

Three registers, at three thousand dollars per annum.
Three receivers, at three thousand dollars per annum.

*By the act (Chap. 13) to provide for the organization of a regiment of mounted volunteers for the defence of the frontier of Texas, and to authorize the President to call into the service of the United States two additional regiments of volunteers.*

One colonel,
One lieutenant colonel,
One major,
One adjutant, with the rank of first lieutenant,
One quartermaster and commissary, with the rank of first lieutenant,
One surgeon,
Two assistant surgeons,
One sergeant major,
One quartermaster and commissary sergeant,
Ten captains,
Ten first lieutenants,
Ten second lieutenants,
Forty sergeants,
Forty corporals,
Twenty buglers,
Ten farriers,
who shall receive the pay and emoluments fixed by existing laws for regiments of cavalry.
Two colonels,
Two lieutenant colonels,
Two majors,
Two adjutants, with the rank of first lieutenant,
Two quartermasters and commissaries, with the rank of first lieutenant,
Two surgeons,
Four assistant surgeons,
Two sergeant majors,
Two quartermaster and commissary sergeants,
Twenty captains,
Twenty first lieutenants,
Twenty second lieutenants,
Eighty sergeants,
Eighty corporals,
Twenty buglers,
Twenty farriers,
who shall receive the pay and emoluments fixed by existing laws for regiments of infantry or dragoons, as they may be received into the service.

*By the act (Chap. 25) to supply deficiencies in the appropriations for the service of the fiscal year ending June 30, 1858.*

Six messengers of the House of Representatives, at a compensation of twelve hundred dollars per annum each.

*By the act (Chap. 31) for the admission of the State of Minnesota into the Union.*

One judge of the district court of the United States,
One district attorney for the United States,
One marshal,
who shall receive the same compensation as the judge, attorney, and marshal for the district of Iowa.

*By the act (Chap. 44) to create a land district in the Territory of New Mexico.*

One register,
One receiver,
who shall receive the same compensation fixed by law for other land officers.

*By the act (Chap. 82) making appropriations for the legislative, executive, and judicial expenses of government for the year ending June 30, 1859.*

Temporary clerks, not exceeding three in number, authorized to be appointed in the office of the district attorney of California until March 3, 1859, at a compensation of $150 each per month.

An additional clerk in the office of the assistant treasurer at Boston, at $1,200 per annum.

Two additional guards of the penitentiary of the District of Columbia, at $660 each per annum.

*By the act (Chap. 92) to authorize the President of the United States, in conjunction with the State of Texas, to run and mark the boundary lines between the Territories of the United States and the State of Texas.*

One superintendent or commissioner. No salary fixed by the act.

*By the act (Chap. 153) making appropriations for the naval service for the year ending June 30, 1859.*

One commissioner to the republic of Paraguay, at a compensation not to exceed seven thousand five hundred dollars.

*By the act (Chap. 154) making appropriations for sundry civil expenses of the government for the year ending June 30, 1859.*

One additional clerk in the office of the Register of the Treasury, at a compensation of sixteen hundred dollars per annum.

One additional clerk in the office of the Treasurer of the United States, at a compensation of sixteen hundred dollars per annum.

*By the act (Chap. 155) making supplemental appropriations for the current and contingent expenses of the Indian Department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June 30, 1859.*

Three special agents for the Indian tribes in Texas. No compensation named in the act.

Three interpreters for the Indian tribes in Texas. No compensation named in the act.

*By the act (Chap. 163) to supply deficiencies in the appropriations for the current and contingent expenses of the Indian Department, and for fulfilling treaty stipulations with various Indian tribes, for the year ending June 30, 1858.*

Three clerks in the office of the Commissioner of Indian Affairs, at a compensation of fourteen hundred dollars per annum.

One commissioner to audit and state the claims for the Indian service in the Territories of Oregon and Washington, at a compensation of eight dollars per day and actual travelling expenses.

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## III.—OFFICES, THE SALARIES OF WHICH HAVE BEEN INCREASED, WITH THE AMOUNT OF SUCH INCREASE.

*By the act (Chap. 82) making appropriations for the legislative, executive, and judicial expenses of government for the year ending June 30, 1859.*

Salary of one messenger in the office of the Secretary of the Senate increased three hundred and thirty dollars per annum.

## APPROPRIATIONS, NEW OFFICERS, ETC.

*By the act* (*Chap.* 156) *making appropriations for the support of the army for the year ending the of June*, 1859.

The superintendent of the Military Academy, while serving as such by the appoint of the President, shall have the local rank, pay, and emoluments of a colonel of engi

The commandant of the corps of cadets at the Military Academy, while serving as by appointment of the President, shall have the local rank, pay, and emoluments colonel of engineers.

The senior assistant instructor of each of the arms of the service, viz: artillery, ca and infantry, shall severally receive the pay and allowances of the assistant profes mathematics.

¶